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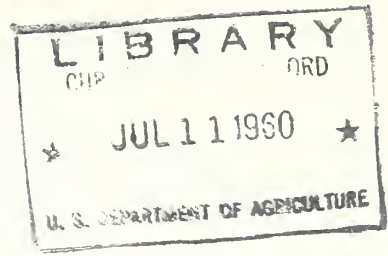
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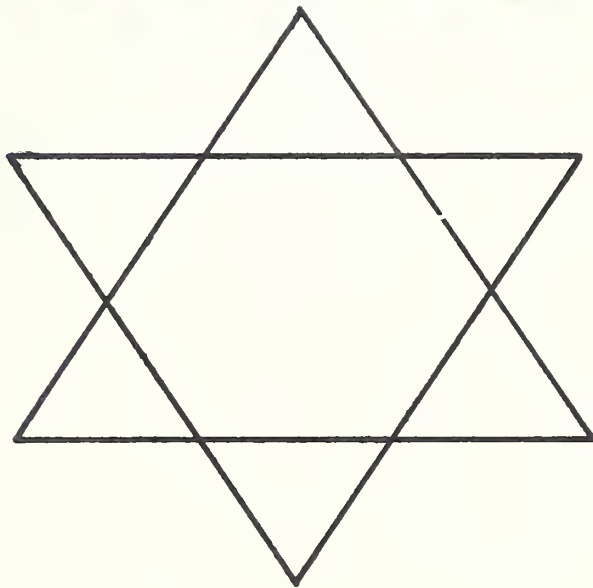
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**June 1960**

**U.S. DEPARTMENT OF AGRICULTURE**  
**Foreign Agricultural Service**



The state of Israel is slightly larger than New Jersey, covering a land area of 7,819 square miles. Of this, about 30 percent is planted in crops or can be used for grazing.

By 1959, the population of the state had reached a total of more than 2 million persons.

Close to 90 percent of these people are Jews. The minority is made up mainly of Muslims and Christian Arabs; for simplification, these groups are usually referred to as non-Jews, or Arabs, throughout the text of this bulletin.

Population density, in relation to the land area, is now in excess of 250 persons per square mile.

The per capita share in the nation's productive farmland is roughly one-half acre per person.

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The place names used in this bulletin conform to the spelling designated by the United States Board on Geographic Names. In some cases, the most common spelling is parenthetically inserted, to prevent confusion.



X THE AGRICULTURAL ECONOMY OF ISRAEL X

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Israel is primarily an industrial, rather than an agricultural, nation. Farming enterprises, with forestry and fisheries, now contribute only about 12 percent of the national income. But impressive strides in agricultural development have been made since the foundation of the state in 1948, in spite of two inhibiting factors: (1) The lack of favorable natural resources; and (2) the strong influence of unrestricted immigration on the national economy.

On the first count, less than a third of this small, low-lying country can be used for agriculture. The greater part is too rugged or too dry. On the second, the nearly a million Jews who freely immigrated into Israel between 1949 and 1959 were mostly without private means; nearly all of them looked to the new state to provide homes and a livelihood. Few of them had been farmers in the lands they left; many were unaccustomed to, or unsuited for, physical labor.

Industry offered little opportunity for work in the early years, but proved farmland--much of it lately abandoned by departing Arabs--was available, as well as potentially productive areas. And, ringed about by hostile neighbors, Israel felt it needed to reinforce its political status by prompt occupation of all of the land. The necessity to supply food for the increasing population, to produce exportable goods for cash, and to increase the country's domestic stocks of foods and fibers in case of further hostilities was immediate and continuous. Thus, dual-purpose border communities--set up to function with equal efficiency as defense posts and as self-supporting farming units--came to be manned largely by immigrants. As the flow of newcomers grew to mass proportions, larger numbers of people were put to farming. Although the Government of Israel has had the support of large resources in foreign aid, the problems of administering the settlement and maintaining this burgeoning young agricultural sector and using it most effectively for the welfare of the state, have been difficult and most complex.

In 1936, Jewish agricultural settlements in Palestine numbered only about 200 and covered just over 360,000 acres, or less than 30 percent of the estimated cultivated area. They were principally located within the area now embraced by the state of Israel, and coincided with most of the main centers of agricultural activity in Palestine at that time--the coastal plain from Haifa to Gaza, the northern plains and valleys, and the Jordan Valley. By 1947 the farmland owned by Jews had increased slightly--to about 395,000 acres. But with the departure of roughly a million Arabs from what is now Israel, following the partition of Palestine, nearly 1,200,000 acres of abandoned Arab holdings--or close to a quarter of the new nation's area--were taken over by the Custodian of Absentee Property for the state. About

half of this land was transferred to national ownership through the Jewish National Fund. There were nearly 750 Jewish agricultural settlements (including institutions and agricultural schools) and rural villages in Israel at the beginning of 1958. Nearly a million acres 1/are cultivated each year; Jewish farmers hold about three-fourths of this land. The irrigated area has been increased, at tremendous expense, by over 250,000 acres. Israeli agriculture has benefitted also from government plans, made with the help of technical assistance from abroad, to direct production along designated lines toward increased farm output, and from strong price and income protection, principally through subsidies on export crops and supplies consumed in the country, and through import controls.

Even so, farm enterprises have been able to absorb only a small fraction of the flood of immigrants. And not all of those settled in the farm communities have been content to stay. The number of Jews engaged in agriculture (including forestry and fisheries) has never since 1948 exceeded 18 percent of the total Jewish labor force. By 1957, gross farm output at constant (1949) prices had increased over 200 percent; but by the same year domestic production accounted for under a third of the national calorie requirement.

Citrus fruit, which, with processed citrus byproducts, has in recent years accounted for roughly two-fifths of the value of Israel's total exports and four-fifths, or more, of the value of all agricultural exports, is by far the primary farm product. Other fruits, garden vegetables, wheat, dairy and poultry products, beef, and livestock feeds are also produced (with the exception of eggs, chiefly for the domestic market), while sugar beets, peanuts, oil crops, and cotton are being grown on a modest scale for commercial processing.

Israel is still seriously deficient in food and feed grains, sugar, fats and oils, cotton, wool, and hides and skins and is not yet self-sufficient in red meat. In most recent years, agricultural imports--largely of these commodities--have exceeded citrus exports in value by from 35 to 40 percent, and accounted for one-fifth, or more, of all imports. Government plans to reduce this imbalance include a further intensification of agriculture, with heavier emphasis on livestock products and export crops; increased domestic production of the imported foods such as sugar, fats, and meat; and the combination of agricultural settlements with industrial projects to accelerate productivity in some areas. Substantial imports of investment capital and maximum expansion of the irrigated land are anticipated in reaching these goals; the country's undeniably inferior unused physical resources for agriculture cannot be reclaimed without heavy expenditure of money and labor.

Israel will undoubtedly curtail its dependence on imports for some agricultural necessities, at the rate that more land can be brought under irrigation, farming techniques improved, production trends adjusted, research extended, and credit continued. But it is unlikely that the agrarian

1/ Crop area, rather than physical area. The physical area of irrigated field crops, vegetables, and potatoes usually constitutes about four-fifths of the crop area.



features of the Israeli economy will ever contribute as much to the national wealth as reasonably can be expected from the nonagricultural sector.

## I. PHYSICAL LIMITATIONS ON AGRICULTURAL DEVELOPMENT

Israel lies in an area of both desert and moderate climate. The size of its cultivable area is mainly restricted by lack of water. If adequate water could be supplied, the soils in a number of presently unproductive sections could support some type of agriculture.

But rainfall varies from relatively light in the western sections of north and central Israel to extremely scanty in the east and southeastern Negeb (Negev), and seasonal distribution is poor. Although heavy dews partly compensate for low rainfall in some localities, surface and ground water is deficient in nearly all of the country. And, particularly along the coast and at elevations below sea level, much of the water available is useless for irrigation because of its high salinity.

Israel has no really large rivers. The Jordan, which flows some 70 miles through Israeli territory, is streamlike in character, as are the shorter Harod and Qishon Rivers, which drain the Plain of Esdraelon (Jezre'el, or Yezre'el) Valley) in north-central Israel, and the Yarqon (Yarkon) River in the west. Although it provides most of the irrigation water for the coastal plain, the Yarqon is only 16 miles in length. Wadis are numerous in the desert regions of Israel, but these are without ground water during much of the year.

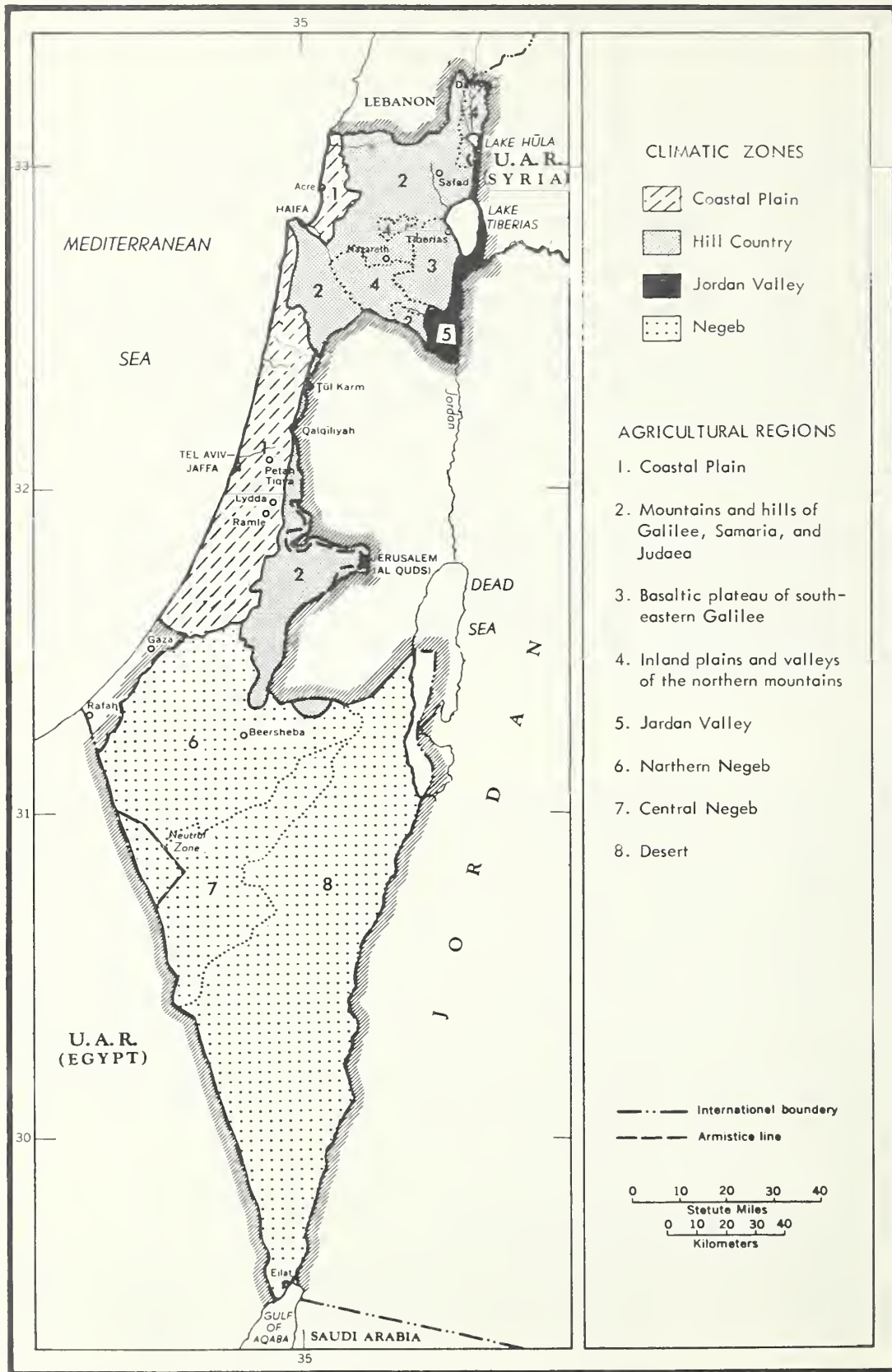
### Topography

Low on the Mediterranean coastline, elevations rise to the east to form ridges of hills and mountains which extend the length of the country. This section is rugged and eroded, but only a few of the mountains exceed 2,000 feet in height. Among these are Har Jarmaq (Mt. Meiron or Mt. Atzmon) near Safad in northern Galilee (just below 4,000 feet); Har Kena'an (over 3,000 feet) in the same vicinity; Har Ramon (3,380 feet) and Har Lots (about 3,100 feet) in the central Negeb; and the peak of the Judaeen Hills near Jerusalem (nearly 2,800 feet). East of the hills and mountains the land again falls away to form the Jordan Valley, the Dead Sea area, and the Ha'arava Rift. This region is semiarid in the north and desert south of the Dead Sea. The Jordan Valley is the lowest part of the long depression which extends from the Taurus Mountains of Turkey through the Red Sea to the lake region of eastern Africa. The shores of the Dead Sea--the lowest area on the earth's surface--are nearly 1,300 feet below sea level.

### Climatic Zones and Agricultural Regions

One or more agricultural regions can be defined in each of Israel's four climatic zones: The coastal plain, the hill country, the Jordan Valley, and the Negeb.

# CLIMATIC ZONES AND AGRICULTURAL REGIONS



Of first importance to agriculture is the coastal plain. Except when dry winds blow from the desert, this zone is warm and humid in summer and mild even in winter, with westerly Mediterranean winds. In the central coastal plain, average temperatures rise from a January minimum of about 45° F. to about 90° in August, the hottest month. Average annual rainfall varies from 20 to 26 inches. As in all other sections of Israel, the heaviest precipitation occurs in the winter months of December, January, and February; rain during June, July, or August is rare. However, much of the rain that falls comes in local downpours which may flood one area and bypass nearby sections. And a locality receiving ample rain in some years may suffer drought in others. Most of the vegetable and citrus crops and much of the other fruits, cotton, and peanuts are grown in the northern coastal plain. Here, market gardening and poultry raising are concentrated, fodder crops for dairy cattle are grown, and grains are dry farmed. Further south on the plain, dry farming increases as rainfall and sources of irrigation water become less plentiful. But the land is generally fertile, supporting vineyards, citrus groves, and dairy and poultry farming based on barley and irrigated forage.

The hill country to the east is cooler and less humid than the coastal zone in summer and receives more rainfall during its colder winters. In the 10 years 1940-49, minimum January temperatures averaged 40° F. and reached a maximum of 90° in August. Western slopes of the hills have heavier rainfall than the semiarid eastern slopes which face the desert. The mean annual rainfall ranges from 29 inches at Har Kena'an to 19 inches at Beit Jimal, southwest of Jerusalem. Deciduous fruits, grapes, and olives are grown on the shallow soils of the mountain regions, and irrigated orchards are found in small valleys or on terraces constructed on the slopes of hills. Pastures are suitable for sheep raising, and green fodder crops are cultivated to support the dairy industry.

Farming on the basaltic plateau of southeastern Galilee is mainly confined to dryland cultivation of wheat and barley, but this region also provides seasonal grazing for sheep. On the northern inland plains and valleys of the hill country, forage crops, vegetables, sugar beets, cotton, deciduous fruits--especially apples--are intensively farmed and milk and eggs are produced. Most of the crops are grown under irrigation, although dryland cultivation of grains and fodder is customary in the eastern part of this region.

The Jordan Valley is warm and dry in summer, without the relief of westerly winds. Winter temperatures and humidity are medium. The annual range is from a January minimum of 47° - 50° F. to a maximum in August of nearly 98°. Most of the valley receives little rainfall; the average dwindles from about 22 inches a year near the Syrian border to about 2 inches on the southwestern shores of the Dead Sea, and practically all farmland must be irrigated. But Jordan water, although saline in varying degrees, is inexpensive to obtain and, combined with the high temperatures of the region, permits very intensive farming. The principal crops are alfalfa and bananas, but vegetables, dates, pomegranates, cotton, milk, and eggs are also produced, and grapefruit and table grapes do well just south of Lake Tiberias (Sea of Galilee). There is little natural grazing, though, for livestock.



Semiarid in the north, the Negeb becomes extremely arid south of Beersheba down to Eilat. This region is warm in summer, cold in winter, and dry throughout the year, with sharp fluctuations in both daily and annual temperatures. At Beersheba the 10-year, 1940-49, seasonal average ranged from a minimum of 43° F. in January to 93° in August. In the 30 years, 1921-50, average annual rainfall at Beersheba registered 8 inches; further south, readings were 4 inches a year, and in the southern desert decreased to less than 1½ inches.

Though agriculture in the Negeb is mainly limited to dry farming, pipelines from the north supply irrigation water to the northern part of the region, and extension of irrigation facilities is planned for the future. Major crops grown are barley, wheat, and sorghum. Some cotton, peanuts, corn, and vegetables are grown on irrigated fields. Because of its heavier rainfall and proximity to irrigation waters, the bulk of the agricultural settlement in the Negeb is in the west.

Fruits and vegetables are cultivated on a small scale in the central Negeb highlands, using land reclamation and water spreading techniques. Small amounts of off-season vegetables, grapes, and semitropical fruits are grown on the western side of the Dead Sea. Several scattered oases along the Ha'arava Rift support date groves, and a number of government experimental farms supply Eilat and vicinity with vegetables, eggs, and poultry. But without irrigation water, most of the Negeb region is of little value to agriculture.

### Soils

The soils of Israel are as varied as the terrain and change from one type to another within small areas. Most soils, except the Terra Rossa clays found in the hills of Galilee and Judaea and in the Mt. Carmel locality, are fairly friable. Toward the Mediterranean and to the south, sandy soil is common, with dunes along the coast and in the western part of the north-central Negeb. Where clay soils have washed down from the hills into the lighter soils of the plains and valleys, relatively rich and sometimes deep alluvial soils have resulted. Much of the soil is neutral to slightly alkaline. In areas below sea level, soils are often too salty for crop production, but some of these support salt-resistant crops after leaching and irrigation with fresh water.

The most important soil types are Reddish Brown soils on alluvium; Terra Rossa soils on limestone and Reddish-Brown soils on basalt; Rendzines on chalk and limestone; Sierozems on chalk and limestone; Red Desert soils and Lithosols; Solonchak soils; and Regosols, or sands.

## II. CHARACTER OF THE AGRICULTURAL ECONOMY

Two very different social groups--the Jewish and the Arab--have farmed in Israel for many years. Until the creation of the state of Israel in 1948, Arab farmers, using primitive traditional cultivation practices, were most numerous. Then most of them fled the country, to be replaced by many

thousands of Jews coming from different lands and bringing with them varying customs and cultures.

Through the countless generations of the dispersal, most of the Jewish people had turned away from agriculture. In contrast to the early settlers who came to Palestine to wrest permanent homes from the soil in the late 19th century and the first decades of the 20th, few Jews who came after 1948 were inclined to become farmers. Yet, to be held, the land had to be settled and made to produce. The number of Jewish farm villages existing when Israel was established as a state was hastily expanded, and transition settlements to accommodate the newcomers appeared. Veteran farmers were called upon to guide the pioneers, and in the years that followed many more agricultural settlements were created. Most recently, a regional settlement program, to combine new villages with supporting industries in some large unsettled areas, has been commenced.

Thus, Jewish farmers, learning to farm with modern techniques, have come to predominate in Israel. The Jewish farming system has emphasized cooperative marketing of high-value citrus, truck crops, milk, and eggs. With generous government assistance, it has supported the many cultivators on the small plots of land customarily allotted to immigrant farmers. But it is this system also which has helped maintain the nation's dependence on imports for the foods, fibers, and feeds that cannot be produced economically on small farms. The need for modification of production and settlement policies has only lately been recognized.



## Land use

Less than 20 percent of the total land area of Israel is in crops.

TABLE 1.--Land use: Area farmed by Jewish and non-Jewish farmers, by crop category, 1958 <sup>1/</sup>

| Crop category                                  | Jewish                       | Non-Jewish                   | Total                        | Percent of total |
|--|------------------------------|------------------------------|------------------------------|------------------|
|  | <u>1,000</u><br><u>acres</u> | <u>1,000</u><br><u>acres</u> | <u>1,000</u><br><u>acres</u> | <u>Percent</u>   |
| Unirrigated field crops . .                    | 460                          | 126                          | 586                          | 11.7             |
| Area in preparation <sup>2/</sup> . . . .      | 13                           | 0                            | 13                           | .3               |
| Irrigated field crops . . . .                  | 111                          | 0                            | 111                          | 2.2              |
| Vegetables, potatoes,<br>and peanuts . . . . . | 59                           | 7                            | 66                           | 1.3              |
| Fruit plantations . . . . .                    | 131                          | 30                           | 161                          | 3.2              |
| Other crops and auxiliary<br>farms . . . . .   | 32                           | 5                            | 37                           | .8               |
| Total cropped land . .                         | 806                          | 168                          | 974                          | 19.5             |
| Total land area . . . .                        | --                           | --                           | 5,004                        | 100.0            |

<sup>1/</sup> Cropped area, rather than physical area. An area is included as many times as it is sown.

<sup>2/</sup> New cultivated areas which were plowed and prepared for sowing grains the following year.

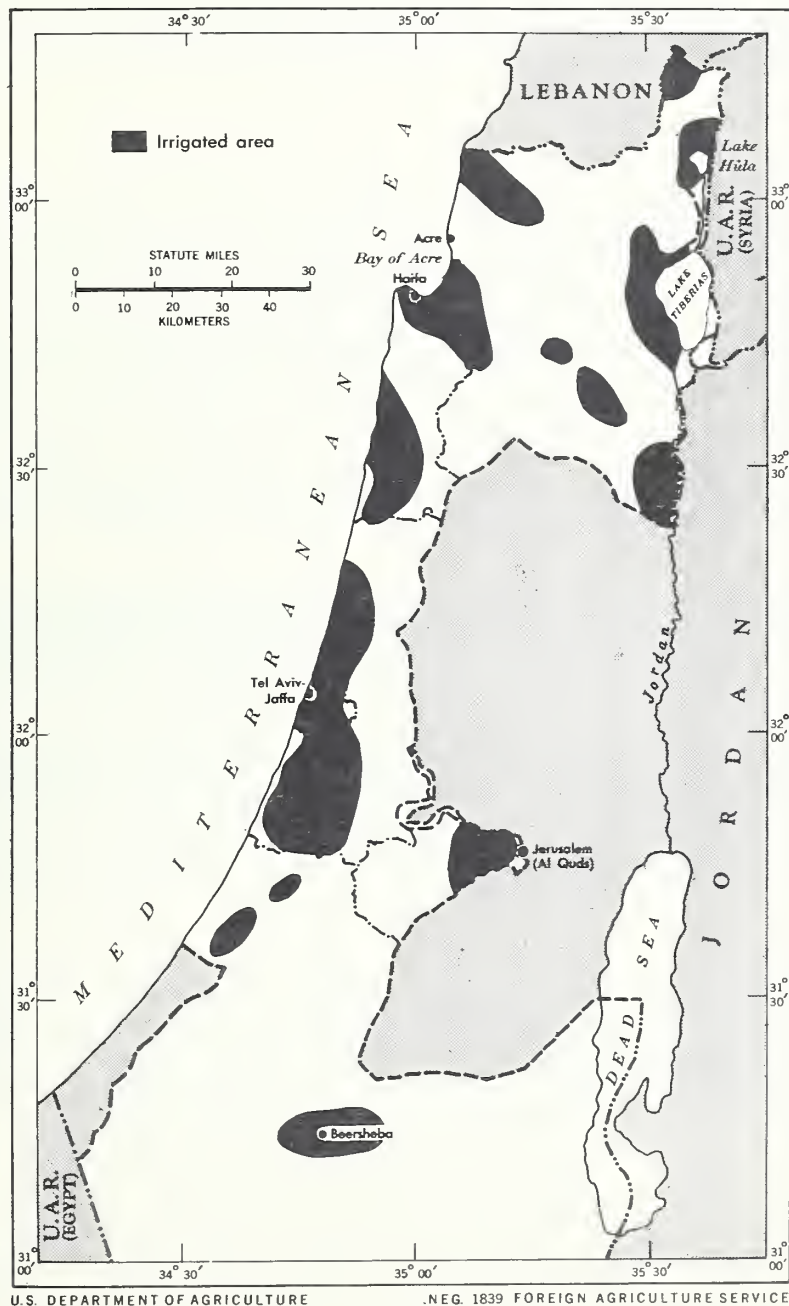
Statistical Abstract of Israel, No. 9, 1957-58.

Grains, fodder crops, and tree fruits cover about three-fourths of the cultivated area. Jewish farmers, growing nearly all the citrus and hay and other fodders, cultivate most of the land; non-Jewish farmers mainly produce grains. In addition to the percentage in crops, another 10 percent of the total land area is suitable for natural grazing, but only about a third of this is actually used for grazing purposes.

The extent to which the cropped area might be increased is uncertain, but it is definitely limited by the amount of water which can be made available. A soil survey being carried out by the Agricultural Research Station at Rehovot has determined that, although roughly half of the land has little or no agricultural potential, the arable area might be extended by some 1,300,000 acres (or to a total of about 45 percent of the land) were sufficient water to be had. In addition, in the neighborhood of 65,000 acres of coastal sand

dunes might be reclaimed.

Pipelines, dams, and deep wells have been constructed as part of the design to increase the cultivable area. There is a project to pipe water from the western Galilee hills and Qishon River through northwestern Israel; two pipelines carry water from the Yaron River to the northern Negeb. Other irrigation projects are those in the Hula Valley and in the Lakhish development area, which includes some 20,000 acres of irrigated land between the Mediterranean coastline north of the Gaza Strip and the border with Jordan.



The national long-term water plan originally called for expansion of the irrigated area to about 425,000 acres by 1960, and eventually to nearly 750,000 acres. By 1959, the goal had been revised downward to close to 560,000 acres; more than half of this, or 304,000 acres, was already under irrigation by 1958. Full utilization of present water resources is being approached, and the opening of the maximum amounts of new land for agriculture, as envisaged by either the national water plan or by the soil survey, will require more water than is now in prospect. Water from the Jordan River could open up another 100,000 acres on the coastal plain and in the Negeb, but there has been no agreement between the riparian states on the division of Jordan waters. Research projects in the desalination of sea water and the diversion of rainwater from the Negeb highlands to the dry lands below for agricultural purposes have not yet been successful on any appreciable scale.

### Size and Types of Farms

Statistics on landholding in Israel indicate the average farm to be less than 10 acres in size. But more than a third of the Jewish-cultivated land, although divided into small, individual plots, is farmed collectively in much larger units. At the beginning of 1958, over 250 of the total 746 Jewish agricultural settlements of all kinds belonged to two of the three types of communal or workers settlements, in which all land is farmed this way. These are:

(1) The collectives (kibbutzim or kvutzot) which are based on common ownership of all resources; self-labor; sharing of expenses and income; and community living.

(2) The less numerous collective smallholders' settlements (moshavim shitufim) which are also farmed in common, although members maintain individual homes. Work and pay are adjusted according to family circumstances.

(3) The cooperative smallholders' settlements, or workers cooperative villages (moshav ovdim) in which individual farmers rely on mutual aid and cooperative buying of supplies and marketing of produce, but operate their own small farms. These usually range from 6 to 8 acres in size. Like the collectives, the cooperative settlements are opposed on principle to employing wage labor.

Other permanent Jewish agricultural settlements--and the non-Jewish settlements as well--have no prejudice against hired labor. Farms of the private cooperative villages (kfar shitufim), sometimes referred to as middle class or private smallholders' settlements are small to diminutive. In the private rural or independent villages or settlements (moshavot) farms range up to 25 acres, and a few in this category are larger.

Non-Jewish farmers operate very small, and often fragmented, farms. According to the Agricultural Census of 1950, nearly 60 percent of those enumerated were less than 8 acres in size, and nearly 90 percent were less than 25 acres. In 1950 the average number of plots per farm was 5.9.



The number of small farms has greatly increased in the last 10 years, as new immigrants have tended to prefer the workers' cooperative type of settlement to the collectives. But the undesirability of a preponderance of small farms became apparent in 1952 when balance of payments difficulties led to demand for exportable farm products and crops to replace imports; most of these could not be grown efficiently on small plots. This need for larger enterprises brought about some pooling of dryland for grain production in various cooperative smallholders' settlements and eventually led to the establishment of a number of "managed" farms, of suitable size for profitable production of such crops as cotton, peanuts, and sugar beets, and also designed to provide employment for large numbers of seasonal laborers and to serve as training centers for immigrants inexperienced in any phase of farming.

### Tenure

Most Jewish farmers hold their land under long-term lease from the Jewish National Fund, which lets land out to qualified persons while retaining it in perpetual trust for the nation. Collectives hold a common lease from the Fund; other workers' settlements sublet the land to individuals. All farmers of one village are allotted equal portions of the nationalized land--the size varying with the productivity of the soil and whether the land is irrigated or to be dry farmed. Rent also varies with the fertility of the land, but is usually 2 percent of the land value per year. Ordinarily, only token rent is required during the first 5 years of settlement; thereafter the rate is increased by stages to the 2 percent rate over a predetermined length of time.

The security of long-term tenure is guaranteed in the lease contracts, which are made for an initial period of 49 years and may be renewed for another 49. Agricultural investment is encouraged, but tenants on nationalized land are subject to certain obligations and restrictions. For instance, the land may not be overcultivated; if irrigation is introduced into a formerly dry area, the tenant's allotment may be reduced in size; reassessment may be made and higher rents levied, if land values rise. Also the lease specifically states the precise purpose for which the land is to be used; that is, for cultivation, for building, etc., and these terms may not be changed without permission from the Jewish National Fund or from the state. Similarly, the tenant may not transfer his land to another tenant without prior approval of the Fund or the state.

In the non-Jewish sector, farms are usually owner-operated, although a relatively small amount of land is leased from private landlords. Non-Jewish farmers often rent supplementary acreage for cultivation and customarily pay up to a third of the crop in lieu of cash rent. Some state land has been leased to Arab farmers, but the extent to which this policy has reduced the number of owner-operated non-Jewish farms is unknown.

### Agricultural Labor

A manpower survey in 1958 reported the total agricultural labor force

(including workers in forestry and fishing) as 115,075 persons--95,750 Jews and 19,325 non-Jews--or 17.5 percent of the total labor force. Some Arabs are hired as laborers by those Jewish farmers who do not object to the principle of hired labor, but most non-Jewish farms are operated by family labor.

Most Israeli's engaged in agriculture are men; in 1957 only 15,500 Jewish and 2,000 non-Jewish women were included in the number of employed agricultural workers. Percent distribution according to employment status for Jews and non-Jews of both sexes in June 1957 was:

|   | Percent |
|---|---------|
| Unpaid family members . . . . .                                 | 17.4    |
| Members of Kibbutzim . . . . .                                  | 19.2    |
| Employers, self-employed, or<br>members of cooperatives . . . . | 25.2    |
| Wage and salary earners . . . . .                               | 38.2    |

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Statistical Abstract, No. 9, 1957-58.

The Jewish agricultural labor force increased steadily between 1949 and 1952 but has since fluctuated. Part of the fluctuation can be accounted for by a comparative lull in immigration beginning between 1952 and 1955. An uptrend in immigration commenced in 1956, but the number of immigrants registered in 1956 and 1957, combined, was less than three-quarters of the number registered in the single year 1951. And also, some of the new settlers, discouraged by the difficulties of adjustment to a different--and to some an unappealing--way of life, have abandoned farming as an occupation.

The relatively high level of farm wages decreed by the state has discouraged some farmers from employing outside help. The opposition--on principle--of the workers' settlements to the use of hired labor has also served to limit the agricultural labor force; kibbutzim are often short of labor, but members prefer the use of machinery to the hiring of unemployed or partly employed farm workers. Even the spread of irrigation has been hindered by the tendency in some settlements to cultivate large tracts by dry farming methods, rather than to hire the extra labor required for irrigated land.

Little statistical data on the extent of unemployment or underemployment in agriculture are available. But since settlers in underdeveloped new agricultural areas often cannot be fully employed at first in actual farm work, such relief projects as land reclamation, road building, and irrigation are frequently utilized to provide supplementary jobs and income.

### Production Practices

Jewish farming in Israel has passed through several stages to reach its present degree of intensity. The first Jewish settlers followed the standard Arab system of farming, based on winter cereals. Mixed farming on unirrigated land, which provided work for more hands and returned a greater profit than cereal culture, followed. Still later, as irrigation became more



more common, a wider choice of crops was possible; rotations could be diversified to best utilize labor and water; fodder was grown; milk, eggs, vegetables, fruits, peanuts, and most recently, sugar beets and cotton were produced.

Today the most common type of Jewish farm combines dairy, poultry, vegetables, and fruits with a small percentage of field crops. Other Jewish farmers emphasize production of legumes, oilseeds, and cereals. On a third type of farm these crops are grown between widely spaced tree crops, such as carobs or olives. In addition there are the unirrigated farms growing deciduous fruits, grapes, and olives in the hill country; the specialized citrus plantations; farms devoted exclusively to vineyards, or poultry, or vegetables; and the new "managed" farms, which mainly produce industrial crops.

Non-Jewish farming is essentially primitive in character. Where rainfall is most limited—as in the regions south of Beersheba and Gaza—barley is alternated with fallow. The area planted varies with each season's rainfall in the locality, and on marginal land a crop can be produced only when enough moisture has accumulated. Further north, Arab farmers rotate winter wheat or barley with a winter leguminous crop or with a summer crop like sesame or millet in the succeeding year. A 3-year rotation of a cereal, a legume, and a summer crop is also used.

The contribution of greatly increased irrigation to the versatility of Jewish farming since the founding of the state is difficult to overstate. By 1958 irrigated crops covered over four times the area irrigated in 1949.

TABLE 2.—Land use: Area under irrigation, by type of crop, 1949, 1954 and 1958

| Crops                                       | 1949 | 1954  | 1958         |                  |       |
|---|------|-------|--------------|------------------|-------|
|   |      |       | Jewish farms | Non-Jewish farms | Total |
|   |      |       | acres        | acres            | acres |
| Field crops . . . . .                       | 15.8 | 47.2  | 112.4        | 0                | 112.4 |
| Vegetables, potatoes, and peanuts . . . . . | 13.3 | 59.6  | 56.3         | 4.2              | 60.5  |
| Fruit plantations . . . . .                 | 37.1 | 58.3  | 100.1        | 1.2              | 101.3 |
| Other crops <sup>1/</sup> . . . . .         | 7.9  | 22.7  | 29.2         | .5               | 29.7  |
| Total . . . . .                             | 74.1 | 187.8 | 298.0        | 5.9              | 303.9 |

<sup>1/</sup> Includes auxiliary farms, nurseries, flowers, fish ponds.

Where water is available, up to three crops a year can be grown. Most Jewish farmers use the sprinkler system, but on larger farms and flat lands, border or furrow irrigation is employed.

Because of the expense of developing water resources and of transporting water; of generating power from imported fuel; of depreciation charges on imported machinery; and of the altitude to which some of the water must be pumped, the cost of irrigation is perhaps three to four times as high as in the United States. However, farmers pay for their water at a subsidized rate, and will probably continue to enjoy this advantage--particularly in the Negeb--even though the net cost may be reduced in the future as crop yields and irrigation techniques improve.

Beyond the need for water, much of Israel's present farmland has required extensive reclamation for full exploitation. In the haste of creating the early settlements, new farm villages were plotted out before soils could be thoroughly examined or the hazards of erosion under cultivation soundly evaluated. First emphasis was given to swamp drainage, rebuilding terraces, digging out stony soil, and reforestation projects. Fields and orchards were laid out in straight lines, most commonly up and down slopes; consequently, much valuable land was washed down to the sea after heavy rains. Especially in the Negeb, deep plowing over large tracts, without regard to contour layout, quickly increased existing soil erosion.

The extent of the need for stringent conservation measures was brought out in 1953, upon the completion by the Soil Conservation Service of Israel of a land inventory which covered roughly 2.4 million acres. Five years later, about 200,000 acres of this land, including nearly 6,500 in plantations, had been put under contour cultivation as a result of the findings of this inventory; about 900 miles of broad-base terraces had been constructed to prevent run-off; tree plantation (primarily for soil conservation) was extended over more than 3,600 acres; and about 185 miles of drainage ditches had been built.

A detailed range survey of nearly 750,000 acres, covering vegetation types and carrying capacities, mapped also by the Soil Conservation Service, led to controlled grazing on about 150,000 acres and the construction of close to 200 miles of fences, thus providing grazing on improved pasturage for 8,000 head of beef cattle, as well as for dairy cows and sheep.

Jewish farmers in Israel have the advantage of a highly mechanized agriculture. The workers' settlements or the privately owned enterprises, such as citrus groves and vineyards, own most of the agricultural machinery and equipment. Some is privately owned in the smallholders' villages, but generally the use of machinery here is organized on a cooperative community basis.

TABLE 3.--Farm machines: Tractors, grain combines, and balers used in agriculture, selected years, 1948-57

| Kind of equipment        | 1948          | 1952          | 1956          | 1957          |
|--------------------------|---------------|---------------|---------------|---------------|
|                          | <u>Number</u> | <u>Number</u> | <u>Number</u> | <u>Number</u> |
| Tractors . . . . .       | 681           | 3,133         | 4,700         | 4,900         |
| Caterpillar . . . . .    | 401           | 1,580         | 1,630         | 1,550         |
| Wheeled . . . . .        | 280           | 1,553         | 3,070         | 3,350         |
| Grain combines . . . . . | 261           | 784           | 896           | 945           |
| Self-propelled . . . . . | (1/)          | 340           | 408           | 455           |
| Drawn . . . . .          | (1/)          | 444           | 488           | 490           |
| Balers . . . . .         | 173           | 563           | 660           | 660           |

1/ Not available.

Statistical Abstract of Israel, No. 9, 1957-58.

A large part of the tools and light mechanized farming equipment used in Israel is manufactured in the country. Israel began assembly and parts manufacture of tractors early in 1958, but most heavy equipment is imported.

As crops have become diversified, the use of chemical fertilizers has become more widespread among Jewish farmers. Until recently most of the supply was imported, principally from the United States, England, Western European countries, and Chile. But Israel has deposits of raw materials for the manufacture of fertilizers, and is an exporter of phosphate rock. By 1959, Fertilizers and Chemicals, Ltd., at Haifa, was able to supply all of the manufactured fertilizers consumed in the country. (1958 consumption for agricultural purposes was over 65,000 long tons of nitrogen fertilizers, some 90,000 tons of phosphate fertilizers, and 4,500 tons of potash fertilizers).

The use of chemical fertilizers by non-Jewish farmers is mainly limited to the operators of a few of the larger farms. Manure is generally spread around date plantations, certain other fruit trees, and truck crops cultivated by the Arabs. Almost the only fertilization of field crops is from droppings of livestock pastured on land fallowed between plantings.

Jewish farmers and some non-Jews use selected seed for their crops. Most domestic requirements are supplied through an Israeli seed growing and supply cooperative, Hazera. The Ministry of Agriculture designates protected areas for seed cultivation, regulates quality and sales, and controls seed imports. Imports of agricultural seeds averaged about 12,000 long tons annually in 1956 and 1957; over 80 percent of seed imports were seed potatoes.

The constant succession of agricultural crops and the development of the large irrigated areas have increased an already troublesome pest population.



But excellent control work is done by several government agencies, the Hebrew University and the larger compounders or manufacturers of pesticides carry on research activities as well. Domestic manufacture of pesticides, selection of imports, and the granting of sales licenses is rigidly controlled by the Plant Protection Division.

TABLE 4.—Pesticide consumption: 1955-57

| Pesticide                                  | 1955             | 1956             | 1957             |
|--|------------------|------------------|------------------|
|  | <u>Long tons</u> | <u>Long tons</u> | <u>Long tons</u> |
| DDT . . . . .                              | 118              | 118              | 148              |
| Dieldrin . . . . .                         | 39               | 39               | 46               |
| Other chlorinated hydrocarbons . . . . .   | 65               | 47               | 50               |
| Sulfur compounds . . . . .                 | 3,051            | 3,543            | 3,543            |
| Spray oils and dinitro compounds . . . . . | 5,905            | 6,397            | 2,461            |
| Other arsenicals . . . . .                 | 60               | 114              | 353              |
| Organic mercurials . . . . .               | 25               | 30               | 30               |
| Thiocarbamates . . . . .                   | 59               | 84               | 118              |
| Quinone derivatives . . . . .              | 2                | 2                | 2                |
| Fumigants . . . . .                        | 12               | 35               | 45               |
| Other pesticides . . . . .                 | 382              | 448              | 456              |

Statistical Abstract of Israel, No. 9, 1957-58.

### III. AIDS TO AGRICULTURAL DEVELOPMENT

#### Direct Government Supports

The government has spent large sums in the last 11 years to establish farm settlements, expand irrigation, and facilitate a variety of agricultural development programs, many of which were devised with the help of foreign technicians.

In the effort to attract farm settlement and maintain farm income, price supports have been freely given. Israeli farmers have been protected also from foreign competition by strong trade barriers. These include foreign exchange controls and quota or import monopolies, the latter commonly combined with high tariffs and surcharges subject to further increase, as necessary, to equate import prices with local prices whenever domestic supplies on the market were abundant.

As expedient, subsidies in one form or another have been widely used, not only to help agriculture but as part of the effort to check inflation by stabilizing the cost-of-living index, to which wages are linked. A system of guaranteed prices, based on cost-of-production formulas, for 85 percent of all food sold has helped to relieve the older settlements of sales problems; new settlements have received specific subsidies also. Subsidies have been

granted to regulate retail prices on essential foods, stimulate production of new crops, provide low water rates, reduce prices for farm requisites, and encourage agricultural exports.

Milk, eggs, vegetables, and fruits have absorbed much of the subsidy payments on commodities. As a result, excessive amounts of these "safe" mixed farming crops are being channeled into consumption at a time when many policy planners feel that Israel urgently needs to increase the single staple and industrial crops that the small farm cannot efficiently produce, but which save foreign currency and provide a link between agriculture and industry in development areas; as, for instance, by providing the cotton grower with employment in nearby cotton mills or the tobacco farmer work in tobacco factories, on a parttime basis. It is realized that a sudden abolition of the subsidy system for traditional crops would ruin many farmers, and perhaps lead to considerable abandonment of farming as an occupation. Consideration has been given to plans to regulate reduction of surplus production for an interim period, as is illustrated by such official suggestions as one to reduce the dairy herd and concurrently increase guaranteed prices to milk producers, and that to decrease the supply of poultry feeds, except feed grains, to prevent further increase in egg production. At the same time, the modification of production and settlement policies which led to the creation of the "managed" farm is being emphasized by the government. Newly established settlements are being built mainly around field-crop types of farms in which large tracts of land are cultivated as a unit to produce industrial crops, rather than the old mixed farming type. So far, progress in cultivation of most of the crops for industrial use or cash crops has been modest.

### Farm Organizations

In contrast to the Arabs of Israel, the majority of whom avoid this degree of regimentation, Jewish farmers belong to a variety of farm organizations, many of which are quite powerful in their special fields. Of themselves, the workers' settlements are multipurpose cooperatives, or collectives, for offering credit, buying supplies, pooling heavy machinery, and marketing farm produce; by the nature of their farming operations, the collectives also provide these services, and more. The private cooperative villages have multipurpose cooperative societies, and Agra Cooperative Societies fulfill a similar function for independent farmers.

Nearly three-fourths of the 850 agricultural cooperatives registered in the country at the beginning of 1957 were multipurpose. The remainder, single-purpose cooperatives on local, regional, or national levels, included irrigation and water supply cooperatives, societies for marketing, processing, insurance, and miscellaneous services for agriculture. In addition, many of the 312 consumer or supply cooperatives, 102 credit cooperatives, and 11 audit unions were agricultural.

The majority of Jewish farmers are connected with one of three parent farm organizations and its central service cooperatives. The largest of this group is the Agricultural Workers' Organization, with its Agricultural Center,



which is an affiliate of the Histadrut (General Federation of Jewish Labor). Members of the Agricultural Workers' Organization automatically become members of the other Histadrut affiliates that service them, such as Tnuva, the most prominent marketing cooperative in Israel; the Cooperative Wholesale Society, which serves both rural and urban consumer and supply cooperatives; and the Audit Union of Workers' Credit Cooperatives. There were close to 190,000 members of the Agricultural Workers' Organization in 1957; most of these were farmers in workers' settlements, others were permanent farm laborers.

More than 6,000 citrus planters and private farmers belong to the Farmers' Federation. Among the main affiliates of the Federation are Pardess Syndicate (the largest citrus growers' organization in Israel); Mehadrin, a plantation development company; Amir Supply, a central supply organization; Amir Bial Marketing Company, and the Farmers' Audit Union.

The third and smallest of the general farm organizations is the Agricultural Council, established by the private cooperative villages and Agra Cooperative Societies. Some 3,000 smallholders, including those living in 2 workers' settlements, are members of the Council, and enjoy the services of its affiliates. These mainly include the central marketing cooperative, Tenne; the Private Farmers' Fund; Aspaka Corporation, a central supply cooperative; and Bahan Audit Union.

Most farmers also belong to various movements and federations within their settlements, mainly concerned with internal functions, such as training, education, and provision of farm credit. In addition, there are many professional or trade organizations in the country, among them the Grain Growers' Association; the Cattle Breeders' Association; the Poultry Breeders' Union, with its affiliate, the Union of Hatchery Farms; and the Vegetable Growers' Association.

Other farm organizations are the commodity marketing boards, which coordinate the activities of the organizations dealing with each commodity and the Joint Agricultural Produce Export Company set up by the government, the Jewish Agency, and the marketing organizations. The government and the Jewish Agency have established still other organizations, such as the Joint Center for Agricultural and Settlement Planning; the Joint Agricultural Training and Extension Center; and the National Water Planning Authority, Tahal, which functions in irrigation planning and research.

Although neither is an agricultural organization, per se, both the Jewish Agency and the Jewish National Fund play major roles in the agricultural economy. As administrator of a large part of the funds collected by the United Jewish Appeal, the Jewish Agency exerts considerable pressure on the course of Israel's agricultural development.

### Agricultural Credit and Investment

Jewish farmers rely heavily on multiple borrowing arrangements for working capital and investment. Particularly in the collectives, short-term loans are often used to finance long-term investments, which in turn may be

paid off by means of new loans and additional borrowing.

The Jewish Agency and the Ministry of Agriculture, through its Development Budget, extend long-term credit. Most Jewish Agency loans are directed to the more recently established settlements where new farmers contract with the Foundation Fund (the financial instrument of the Agency) for initial credits to establish their farms, purchase stock and equipment, and irrigate the land. Loans are made at a low interest rate ( $3\frac{1}{2}$ -4 percent) for periods of from 25 to 49 years, and payment of interest and principal is often waived during the first 5 years of the contract.

The Development Budget supplies a high proportion of the funds loaned to farmers by the Jewish Agency. In addition, the Ministry of Agriculture makes loans from the Development Budget to increase the production of the established farms. These loans, which are partly handled through the Israel Agricultural Bank, a state institution founded in 1951, are ordinarily for 7 to 8-year periods and require interest at 5 percent.

Medium-term loans, usually for from 1 to 4 years, are made by the Agricultural Bank—also out of the Development Budget—not infrequently in cooperation with other banks; or by the other banks alone, although these specialize in short-term loans; and by the Jewish Agency.

Short-term loans (those payable within a year's time) are principally available through marketing organizations, cooperative or private suppliers, or private banks, but may also be made by the Jewish Agency, the Agricultural Bank, the Development Budget, and through funds of credit cooperatives and settlement organizations. An official rate of interest is prescribed, but higher costs to the borrowers, either openly stated as interest or concealed in other terms of the contract, are not uncommon.

Agricultural credit has expanded rapidly in the last 10 years. The burden of indebtedness is obscured by a lack of recent data mainly for short-term loans other than bank loans, as well as inadequate data on the value of farm assets. But the latest available estimate indicates a probable ratio between debt and farm assets of over 20 percent for the older workers' cooperative villages; up to 50 percent for older collectives, and higher percentages for the younger settlements.

These high ratios are perhaps best explained with the reiteration that most of Israel's immigrant farmers were either destitute, or nearly so when settled on the land. Borrowing to develop their small plots was the logical, if not the only, recourse and this process was made simple for the borrower.

Investment in agriculture is mainly directed toward new settlement, including housing and irrigation. Soil conservation projects, orchards, purchase and maintenance of machinery and equipment, and livestock absorb the remainder. Net investment in agriculture (after deducting for depreciation) amounted to about \$53 million (IL 95 million) in 1956-57, and \$76 million (IL 135 million) in 1957-58, at current prices. Most investment spending, in the 10 years of Israel's statehood, has been financed by the government from



the Development Budget or Jewish Agency funds, largely by loans to organizations or individuals. Only a small percentage of the funds invested in agriculture has come from private resources.

### Agricultural Research, Extension, and Education

Much progress has been made in agricultural research in Israel, in spite of the segmentized and uncoordinated approach which characterized activities during most of the years of statehood, and led to duplication of functions and other operational inefficiencies attendant on lack of a central administrative control. (In 1954 agricultural research was being carried on in 8 divisions of the Ministry of Agriculture, by 14 divisions and laboratories and 3 branch field stations of the Rehovot Research Station, by the Research Council of Israel, and a number of schools and public and private institutions.) Although some research was still being conducted by other organizations during 1959, the current government plan is ultimately to concentrate all agricultural research under the Rehovot Agricultural Research Station, southeast of Tel Aviv-Jaffa, which is comprised of institutes of soil science, field crops, horticulture, plant protection, livestock, food technology, and applied botany, in addition to a laboratory of analytical chemistry and a division of statistics and experimental design. The headquarters station at Rehovot is supplemented by well-equipped facilities at Beit Dagon, into which some of the laboratories formerly at Rehovot have been moved. Also at its disposal are 3 experiment farms, about a thousand acres at Beit Dagon, over 700 acres at Neveh Ya'ar on the Esdraelon Plain, and about 600 acres on loess soil at Gilat in the northern Negeb. Each of these is designed to deal with the agricultural problems peculiar to the general area of its location--the coastal plain, the northern plains and valleys, and the Negeb.

Agricultural extension activities also have suffered from lack of central control, with various agencies throughout the country carrying on extension projects. No unified national system of extension is yet in operation. The Jewish Agency finances and conducts most of the extension work now being done in Israel. But the Ministry of Agriculture has recently initiated the organization of a central extension program which will require cooperative effort by the Ministry and the Jewish Agency. Under this plan, Joint Extension Centers in each of two districts are now authorized to organize extension staffs.

Agricultural instruction is offered to over 7,400 Israeli students, principally at the secondary level. The majority of the students are Jewish and a high percentage of them are urban dwellers not previously associated with farm life. Three government schools are operated under the guidance of the Ministry of Agriculture, which also supervises preparation for agricultural settlement at youth training centers and, in conjunction with the Ministry of Education, conducts continuation courses at various nongovernmental secondary schools. More advanced training is now available at the Hebrew University's Faculty of Agriculture at Rehovot and at the Haifa Technion. Through its Operations Mission to Israel, the United States Government has provided technical assistance in a plan to reorganize agricultural training in an Agricultural College Complex--a system similar to that of the

U. S. land-grant colleges. Merger of the Faculty of Agriculture at Rehovot and the Rehovot Agricultural Research Station is under way. A school of home economics to train teachers and extension workers will be incorporated into the Agricultural College Complex.

#### External Aids to Agriculture

A large part of the impressive sums in foreign aid of which Israel has been the recipient since the foundation of the state has been used for investment in agriculture. The Jewish Agency has relied heavily on foreign collections, principally in the United States, for funds used in land settlement expenses. Agriculture has shared also in the reparations and restitution payments contributed in the form of goods and services by Germany since 1953, as well as in the grants-in-aid and food surpluses provided by the United States Government.

Both the United States Government and the Food and Agriculture Organization of the United Nations have detailed technicians to help with national planning for agriculture; in the development of special programs such as that for crop diversification; expansion of irrigation; upbreeding of livestock; plant protection and animal pest control; improved farm practices; agricultural education, research, and extension; and training of Israeli technicians. Private foreign investors have put more than \$18 million into Israel's citrus industries.

#### IV. AGRICULTURAL PRODUCTION

Israel produces chiefly high-quality, low-calorie foods, such as citrus, various other fruits, vegetables, milk, eggs, and poultry. A large part of the milk, eggs, and poultry is produced with imported feed. Israel also depends heavily on imports for its supplies of wheat, sugar, meat, cotton, and tobacco. It has a large export surplus of citrus fruit. Citrus leads all other farm products in value of output, and is the country's major foreign exchange earner.

TABLE 5.-- Major farm products: Acreage, production, net trade, and supply for consumption, 1957

| Product                    | Area planted           | Production               | Net trade<br>1/          | Available<br>for<br>consumption |
|----------------------------|------------------------|--------------------------|--------------------------|---------------------------------|
|                            | <u>1,000<br/>acres</u> | <u>1,000<br/>L. tons</u> | <u>1,000<br/>L. tons</u> | <u>1,000<br/>L. tons</u>        |
| Citrus fruit . . . . .     | 58                     | 404                      | - 298                    | 106                             |
| Fruits other than citrus.. | 85                     | 88                       | 1                        | 89                              |
| Potatoes . . . . .         | 13                     | 91                       | 7                        | 98                              |
| Other vegetables . . . . . | 40                     | 237                      | - 2                      | 235                             |
| Wheat . . . . .            | 142                    | 82                       | 280                      | 362                             |
| Peanuts . . . . .          | 13                     | 18                       | 1                        | 19                              |
| Pulse crops . . . . .      | 30                     | 9                        | 4                        | 13                              |
| Barley . . . . .           | 142                    | 73                       | 41                       | 114                             |
| Corn . . . . .             | 24                     | 37                       | 44                       | 81                              |
| Sorghum . . . . .          | 66                     | 36                       | 94                       | 130                             |
| Hay . . . . .              | 87                     | 121                      | --                       | 121                             |
| Green fodder and silage .  | 63                     | 1,193                    | --                       | 1,193                           |
| Sugar . . . . .            | 2/ 3                   | 6                        | 40                       | 46                              |
| Cotton . . . . .           | 12                     | 4                        | 4                        | 8                               |
| Tobacco . . . . .          | 8                      | 2                        | 2                        | 4                               |
| Milk . . . . .             | --                     | 232                      | 15                       | 247                             |
| Eggs . . . . .             | --                     | 34                       | - (3/)                   | 34                              |
| Meat 4/ . . . . .          | --                     | 29                       | 8                        | 37                              |

1/ Minus equals excess of exports over imports.

2/ Area in sugar beets.

3/ Less than 500 long tons.

4/ Including poultry meat.

Statistical Abstract of Israel, No. 9, 1957-58, and Embassy reports.

### Main Crops

Citrus:--Except for small areas near Acre and in the vicinity and south of Lake Tiberias, most of Israel's citrus groves are located on the coastal plain, from Haifa in the north to the Gaza strip. Nearly all the citrus area of former Palestine remained within Israel at partition, but citriculture--already contracted by loss of shipping during World War II--fell into further decline immediately after 1948 as Arab groves were abandoned. Recovery was slow in the early years of statehood, but output has since been increased to average 436,000 long tons annually in the 1955-59 period, and reached 546,000



tons in 1959.

In most recent years, citrus fruits, with processed byproducts, have accounted for about two-fifths of the value of all Israel's exports. In 1957-58, 76 percent of production was exported as fresh fruit; the proportion was 68 percent in the following year. The United Kingdom, Western Germany, Belgium, France, the Netherlands, and the Scandinavian countries are principal export outlets, together taking over 90 percent, in terms of value, of 1958-59 offerings.

Fresh fruits which cannot be disposed of abroad, or are not of export quality, find a rather static market for consumption within the country, or alternatively, are diverted to Israel's modern citrus byproducts industry, which has reached an advanced stage of diversified production of high-quality manufactures for export, mainly canned grapefruit, marmalades and pulp for marmalade, citrus cells for beverages and essential oils. Dried citrus peel is used in Israel for cattle feed.

During the 5 years 1955-59 an average of about 30 percent of Israel's citrus has been absorbed at home, although the amount retained varies from year to year with the quality of the crop. Because severe climatic conditions in the 1958-59 season lowered the proportion of fresh fruit suitable for export, citrus processing industries were allotted 106,000 long tons for manufacture in that year, compared to 28,000 tons in the 1957-58 season. Consumption of fresh citrus fruit in Israel remained unchanged, at 68,000 tons, in both years.

The Shamouti orange is the leading commercial fruit. In the 1958-59 season Shamouti made up 71 percent of the crop, while Valencia oranges and Marsh Seedless grapefruit, combined, comprised over a fifth of total production. Both Italian and American varieties of lemons, as well as limes, mandarines, and clementines (a tangerine-like fruit), are produced in limited amounts.

Citrus harvests begin in September with lemons and grapefruit, the fruit grown inland maturing several weeks earlier than that grown on the coastal plain. Clementines are picked from about mid-October. The Shamouti harvest begins a month later, attaining its height from January through March. The late orange crop consists of Valencias. Both Shamouti and Valencia oranges are sold in export markets under the trade name of Jaffa.

Most citrus plantations are privately owned. The majority are under 7 acres in size, and where the land in citrus is quite limited (or where it belongs to kibbutzim or moshavim) cultivation is customarily by the owners. Other grove owners, many of whom are employed elsewhere, leave maintenance and cultivation to hired labor or turn their groves over to private companies specializing in citrus cultivation. All citrus is grown under irrigation; the old basin method is being replaced by sprinkler systems, usually the mobile, perforated type of sprinkler similar to that used in Florida. Most of the groves are maintained by nontillage. Nitrate fertilizers are ordinarily employed. About a fourth of the groves are sprayed yearly for pest control; however, many groves require spraying only every second or third year.

Citrus growers are highly organized; through their organizations or cooperatives, facilities for efficient production and disposal of the crop are available to individuals. Each citrus cooperative has its own grading and packing house and the use of modern, locally manufactured, grading tables and bins is becoming common. There were 28 packing houses in Israel in 1959; of these, 19 are served by railway lines.

The Citrus Marketing Board, made up of representatives of the government, citrus growers, and marketing organizations, supervises picking and packing; determines the amount of fruit to be directed to export channels, to industry, and into fresh consumption; fixes prices; and assumes sole responsibility under the law for marketing of the crop--both within the country and abroad. The actual handling of the fruit is done by the marketing organizations, principally cooperatives, which in effect are contractors for the Board. In 1957, Tnuva Export, a subsidiary of the Central Marketing cooperative for the workers' settlements, marketed over a fifth of the crop. In the same year about 45 percent of all citrus exports were marketed by Pardess Syndicate (Farmers' Federation affiliate), the principal citrus cooperative of the private growers.

TABLE 6.--Citrus: Area, production, and exports, average 1953-57, selected years, 1939-59

| Year                         | Area                  |                       | Production              | Net exports             | Available for domestic consumption |
|------------------------------|-----------------------|-----------------------|-------------------------|-------------------------|------------------------------------|
|                              | Planting              | Bearing               |                         |                         |                                    |
|                              | <u>1,000</u><br>acres | <u>1,000</u><br>acres | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons            |
| Average:                     |                       |                       |                         |                         |                                    |
| 1953-57 . . . . .            | 47                    | 32                    | 409                     | 268                     | 141                                |
| Annual:                      |                       |                       |                         |                         |                                    |
| 1939 <sup>1/</sup> . . . . . | 74                    | 39                    | 709                     | 603                     | 106                                |
| 1948 <sup>1/</sup> . . . . . | 64                    | 57                    | 527                     | 392                     | 135                                |
| 1949 . . . . .               | 31                    | 31                    | 268                     | 152                     | 116                                |
| 1950 . . . . .               | 33                    | 31                    | 266                     | 165                     | 101                                |
| 1953 . . . . .               | 34                    | 31                    | 346                     | 198                     | 148                                |
| 1954 . . . . .               | 41                    | 31                    | 463                     | 298                     | 165                                |
| 1955 . . . . .               | 47                    | 32                    | 386                     | 258                     | 128                                |
| 1956 . . . . .               | 53                    | 32                    | 445                     | 287                     | 158                                |
| 1957 . . . . .               | 58                    | 33                    | 404                     | 298                     | 106                                |
| 1958 . . . . .               | 62                    | 34                    | 397                     | 301                     | 96                                 |
| 1959 . . . . .               | 68                    | 36                    | 546                     | 371                     | 174                                |

<sup>1/</sup> Former Palestine.

Statistical Abstract of Israel series; Embassy reports.

TABLE 7.--Citrus: Domestic consumption, 1957-58 and 1958-59

| Variety            | 1957-58                 |                         |                         | 1958-59                 |                         |                         |
|--------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                    | Processed               | Fresh                   | Total                   | Processed               | Fresh                   | Total                   |
|                    | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons | <u>1,000</u><br>L. tons |
| Oranges:           |                         |                         |                         |                         |                         |                         |
| Shamouti . . . .   | 14                      | 36                      | 50                      | 74                      | 33                      | 107                     |
| Valencia . . . .   | (1/)                    | 9                       | 9                       | 11                      | 10                      | 21                      |
| Total . . . .      | 14                      | 45                      | 59                      | 85                      | 43                      | 128                     |
| Grapefruit . . . . | 12                      | 6                       | 18                      | 15                      | 6                       | 21                      |
| Lemons . . . . .   | 2                       | 3                       | 5                       | 4                       | 3                       | 7                       |
| Other citrus . . . | 0                       | 14                      | 14                      | 2                       | 16                      | 18                      |
| Total citrus . .   | 28                      | 68                      | 96                      | 106                     | 68                      | 174                     |

1/ Less than 500 tons.

Statistical Abstract of Israel series; Embassy reports.

Fruits Other Than Citrus.--Like the citrus groves, Israel's orchards and vineyards suffered neglect and damage during the hostilities of partition. Because of the need for preliminary preparation of the plantings, irrigation, and training new fruit growers, the task of rehabilitation was slow and expensive, but by 1959 the area in fruits, exclusive of citrus, had increased by nearly 70 percent to some 95,000 acres. Most of this acreage is cultivated by the Jewish workers' settlements, although local and foreign investors maintain orchards, and non-Jewish farmers produce about 10 percent of the fruits other than citrus, largely for home consumption.



TABLE 8.--Fruit, excluding citrus: Production, selected years, 1949-59

| Kind                                  | 1949                           | 1956                           | 1957                           | 1958                           | 1959 <sup>1/</sup>             |
|---------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|                                       | <u>1,000</u><br><u>L. tons</u> | <u>1,000</u><br><u>L. tons</u> | <u>1,000</u><br><u>L. tons</u> | <u>1,000</u><br><u>L. tons</u> | <u>1,000</u><br><u>L. tons</u> |
| Grapes . . . . .                      | 18                             | 32                             | 43                             | 47                             | 57                             |
| Olives . . . . .                      | 11                             | 25                             | 7                              | 18                             | 18                             |
| Bananas . . . . .                     | 3                              | 23                             | 20                             | 28                             | 31                             |
| Deciduous fruits . . . . .            | 5                              | 12                             | 13                             | 18                             | 26                             |
| Miscellaneous <sup>2/</sup> . . . . . | 2                              | 9                              | 5                              | 12                             | 12                             |
| Total . . . . .                       | 39                             | 101                            | 88                             | 123                            | 144                            |

<sup>1/</sup> Preliminary.

<sup>2/</sup> Figs, dates, subtropical, and other miscellaneous fruits, except melons.

Statistical Abstract of Israel series, and Embassy reports.

The greatest increase in fruit plantings except citrus was in grapes. The center of the wine industry is at Rishon le Zion on the coastal plain, but there are extensive vineyards near Lake Tiberias and in the mountains from Galilee through Judaea, and small grape-growing regions on the western slopes of the Dead Sea. Most grapes are consumed locally, either fresh or as wine, although small refrigerated shipments of grapes have been made to the United Kingdom and the Federal Republic of Germany, and some wine is exported, principally to the United States, for Jewish ritual purposes.

Olives for oil have long been cultivated by non-Jewish farmers in Israel, principally under dry culture in the northern and central hills. But in recent years Jewish farmers have begun to cultivate olives for oil and the large pickling varieties for the market. Their groves lie mainly in the Beit Shean Valley and in the Southern District near the Negeb; some are irrigated. Total area in olive plantations is now about 33,000 acres. Several modern oil presses have been constructed to increase output of oil, and in alternating years of heavy production there are minor exports.

Since 1949, when the area in bananas amounted to less than a thousand acres in the Jordan Valley, banana plantations have been extended (by 1959) to cover nearly 5,500 acres of land, much of which is located on the northern coastal plain, where, in spite of periodic frosts which reduce production in some years, growing conditions are usually favorable.

Deciduous fruits, mainly apples, plums, pears, apricots, and peaches; figs and dates; and subtropical varieties, such as avocados, persimmons, mangoes, loquats, guavas, and pomegranates, covered about 19 percent of the area in fruits other than citrus in 1959. The hilly regions of northern and central Israel, the Plain of Esdraelon, the Lake Hula Valley, and the area east of Haifa are the main centers for cultivation of deciduous fruits,

although minor quantities are grown under irrigation in the Negeb. Date groves extend from the Jordan Valley to the oases; figs are found principally in the mountains of Judaea; and most subtropical plantations are on the northern coastal plain and in the Jordan Valley. The bulk of the orchard fruit produced is consumed locally, although trial shipments to export markets have been made from time to time.

Vegetables.--Production of vegetables has more than tripled since 1949 and except for small quantities of specialized items, such as seed potatoes, Israel has met or exceeded its own vegetable requirements since 1953.

TABLE 9.--Vegetables: Area and production, selected years, 1949-59

|                        | 1949                 | 1957                 |                      |                      | 1958                 | 1959 <sup>1/</sup>   |
|------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                        |                      | Jewish farms         | Non-Jewish farms     | Total                |                      |                      |
| Area:                  | <u>1,000 acres</u>   | <u>1,000 acres</u>   | <u>1,000 acres</u>   | <u>1,000 acres</u>   | <u>1,000 acres</u>   | <u>1,000 acres</u>   |
| Potatoes . . . . .     | (2/)                 | 12                   | 1                    | 13                   | 14                   | (2/)                 |
| Other vegetables . . . | (2/)                 | 34                   | 6                    | 40                   | 54                   | (2/)                 |
| Total . . . . .        | 17                   | 46                   | 7                    | 53                   | 68                   | (2/)                 |
| Production:            | <u>1,000 L. tons</u> | <u>1,000 L. tons</u> | <u>1,000 L. tons</u> | <u>1,000 L. tons</u> | <u>1,000 L. tons</u> | <u>1,000 L. tons</u> |
| Potatoes . . . . .     | 25                   | 90                   | 1                    | 91                   | 96                   | 94                   |
| Other vegetables . .   | 76                   | 211                  | 26                   | 237                  | 265                  | 270                  |
| Total                  | 101                  | 301                  | 27                   | 328                  | 361                  | 364                  |

<sup>1/</sup> Preliminary.

<sup>2/</sup> Not available.

Statistical Abstract of Israel, No. 9, 1957-58; Embassy reports.

Food Grains.--Wheat products contribute heavily to the national food supply (more than two-fifths, in terms of calories, in 1957). But only from 15 to 20 percent of Israel's requirements in wheat and flour are domestically produced, although fully a fourth of all dry cultivated land is planted to durum and common varieties.

Jewish farmers plant about 70 percent of the area in wheat. Production is heaviest in Galilee and in the south, but the grain is grown throughout the country wherever there is sufficient water.

Jewish farmers have generally preferred to raise feed grains for conversion to high-value eggs, meat, and dairy products, rather than food grains.

But the national plan to increase self-sufficiency in bread grains, augmented by the offer of about 1-1/3 tons of barley or corn for a ton of wheat, has led to emphasis on acreage in wheat in most years; at the expense of barley plantings.

Depending on seasonal rainfall, wheat yields vary greatly from year to year, and periodic droughts may drastically reduce the crop. But better cultivation practices, pest and disease control and supplementary irrigation where needed have lately combined to raise the yield per acre since 1949 from about 10 bushels an acre to an average of about 18 bushels per acre in the 3 years 1957-59.

Wheat imports are controlled by government monopoly, and in the last 2 or 3 years most of Israel's import requirements have been obtained from the United States. Haifa, where the grain can be mechanically pumped from the ships' holds, bagged and loaded, or poured in bulk into truck transport, is the chief port of entry. Special railway cars have been adapted also for transporting grain in bulk, and conveyors are used in offloading cars to trucks for distribution to mills and warehouses throughout the country. Grain storage facilities in Israel reached 170,000 tons by 1959 (including 40,000 tons of feed grains) and are currently being increased by a further 40-50,000 ton capacity. There are 23 operating flour mills, about equally divided between the Tel Aviv-Jaffa region and the Haifa District. The government pays millers a milling fee and regulates the quantity of flour to be delivered against each ton of wheat. In 1958 nearly 250,000 tons--mostly imported--were milled into flour.

TABLE 10.--Wheat: Area, yield, production, imports, and supply for consumption, average 1953-57, annual 1949 and 1953-59

| Year                   | :<br>Area<br>planted:        | :<br>Yield<br>:               | :<br>Production:<br>:          | :<br>Net<br>imports:           | :<br>Available<br>for domestic<br>consumption |
|------------------------|------------------------------|-------------------------------|--------------------------------|--------------------------------|---|
|                        | <u>1,000</u><br><u>acres</u> | <u>Bu. per</u><br><u>acre</u> | <u>1,000</u><br><u>L. tons</u> | <u>1,000</u><br><u>L. tons</u> | <u>1,000</u><br><u>L. tons</u>                |
| Average:               |                              |                               |                                |                                |   |
| 1953-57 . . . . .      | 112                          | 16.0                          | 50                             | 312                            | 362   |
| Annual:                |                              |                               |                                |                                |   |
| 1949 . . . . .         | 75                           | 10.4                          | 21                             | 151                            | 172   |
| 1953 . . . . .         | 86                           | 12.5                          | 29                             | 322                            | 351   |
| 1954 . . . . .         | 77                           | 16.0                          | 33                             | 320                            | 353   |
| 1955 . . . . .         | 117                          | 11.2                          | 35                             | 311                            | 346   |
| 1956 . . . . .         | 140                          | 19.4                          | 73                             | 325                            | 398   |
| 1957 . . . . .         | 142                          | 21.5                          | 82                             | 280                            | 362   |
| 1958 . . . . .         | 146                          | 15.9                          | 62                             | 279                            | 341   |
| 1959 Preliminary . . . | 154                          | 15.8                          | 65                             | 305                            | 370   |

Statistical Abstract of Israel series; Embassy reports.



Very minor amounts of oats, pearled barley, and corn are used for food in Israel, and the Bedouins of the Negeb rely on barley grain for food, particularly in seasons when the wheat harvest is poor. Plantings of rice, about 1,100 acres in 1958, produced about 1,300 tons in that year; there was no substantial change in rice acreage in 1959.

Other Food Crops.--Virginia-type peanuts can be grown in most parts of Israel, but over half the area cultivated is located in the Central District on the Plain of Sharon and east and south of Tel Aviv-Jaffa. More than a quarter of the area in peanuts is in the Southern District.

Jewish farmers produce the bulk of the crop. Since 1958, harvesting has been completely mechanized, and the four large peanut storehouses in the country have modern grading and sorting equipment. Between 1949 and 1959, overall production has increased from less than 500 long tons to between 15-17,000 tons of nuts in the shell, although there have been fluctuations in the acreage sown and production in recent years, mainly as a result of variations in production costs and guaranteed prices. First-grade Israeli peanuts have commanded prices as high as \$350 a ton on European markets. In 1958 about 5,600 tons were exported; the remainder was consumed within the country, either fresh or in the form of edible oil. The byproduct, peanut oilmeal, is used for feed.

Cultivation of pulse crops for food is not widespread in Israel, although these crops are popular in rotation for soil enrichment.

Feed Crops.--Most of Israel's requirements of feed grains are imported, but barley and small amounts of oats are grown as winter feed crops; summer feed grains are principally sorghum and corn. Jewish farmers cultivate large areas of fodder crops as a basis for intensive agricultural enterprises.

Following the national plan to increase bread grain production, the area in barley has been greatly reduced since 1953, when 227,000 acres were planted, to a total of only 142,000 acres by 1959. Most barley is produced in the northern Negeb and will probably continue to be widely grown in arid regions such as these because of its high resistance to drought--but some is produced in central Israel and in the north. Yields are generally superior in the north, because of greater rainfall, but national output varies sharply from year to year with annual precipitation throughout the country. Barley grown on Jewish farms averaged nearly 32 bushels per acre in 1957, in contrast to 19 bushels per acre attained in the same year by non-Jewish growers, who cultivated about a fourth of the crop. An average of a little less than 30,000 tons of barley was imported annually in the 1956-58 period, mainly from the United States, France, Algeria, and Denmark.

TABLE 11.--Barley, sorghum, and corn: Area, production, net imports, and total supply, selected years, 1949-59

| Crop               | Unit         | 1949 | 1953 | 1955 | 1957 | 1958 | 1959 |
|--------------------|--------------|------|------|------|------|------|------|
| <b>Barley:</b>     |              |      |      |      |      |      |      |
| Area planted . . . | 1,000 acres  | 43   | 227  | 171  | 142  | 144  | 142  |
| Production . . .   | 1,000 l.tons | 20   | 63   | 41   | 73   | 52   | 53   |
| Net imports . . .  | 1,000 l.tons | 18   | 48   | 22   | 41   | 24   | (1/) |
| Total supply . . . | 1,000 l.tons | 38   | 111  | 73   | 114  | 76   | --   |
| <b>Sorghum:</b>    |              |      |      |      |      |      |      |
| Area planted . . . | 1,000 acres  | 12   | 49   | 33   | 66   | 43   | 47   |
| Production . . .   | 1,000 l.tons | 3    | 13   | 11   | 36   | 34   | 39   |
| Net imports . . .  | 1,000 l.tons | 31   | 2    | 107  | 94   | 244  | (1/) |
| Total supply . . . | 1,000 l.tons | 34   | 15   | 118  | 130  | 278  | --   |
| <b>Corn:</b>       |              |      |      |      |      |      |      |
| Area planted . . . | 1,000 acres  | 18   | 19   | 23   | 24   | 15   | 9    |
| Production . . .   | 1,000 l.tons | 7    | 11   | 26   | 37   | 28   | 25   |
| Net imports . . .  | 1,000 l.tons | 24   | 18   | 2    | 44   | 41   | (1/) |
| Total supply . . . | 1,000 l.tons | 31   | 29   | 28   | 81   | 69   | --   |

1/ Not available.

Statistical Abstract of Israel, No. 9, 1957-58; Embassy reports.

Bedouins use some sorghum for food, especially in drought years, but most sorghum produced in Israel or imported is used for livestock feed. About half the land in sorghum is in the Northern District. The main producing area of central Israel is southeast of Tel Aviv-Jaffa. And like barley, sorghum thrives in the dry regions of the country; over 20 percent of the sorghum area is in the northern Negeb. Most of the crop is dry farmed, although cultivation under irrigation is on the increase. United States varieties introduced into Israel in 1952, and a domestically developed hybrid variety have contributed to generally higher yields since 1949. Under irrigation, a particularly outstanding yield of close to 60 bushels per acre was recorded by one collective in the Negeb in 1957. But since 1949, imports of sorghum for feed have been consistently heavy, averaging over 100,000 tons yearly between 1954-58, with an annual average of about 170,000 tons for the 2 years 1957 and 1958. Most sorghum imports originate in the United States.

Production of corn for feed expanded until 1958 (principally because of the use of irrigation, fertilizers, and selected seed), when acreage was reduced in favor of sorghum. In 1959, 70 percent of the area planted to corn was irrigated. With irrigation, hybrid varieties yield an average of from 80 to 95 bushels per acre, with peak production of over 150 bushels an acre.

Additional supplies of corn are regularly imported; average imports were about 25,000 tons annually between 1954-58, and 42,000 tons yearly in 1957 and 1958, but quantities vary with needs from year to year. Most imports are from the United States.

The main fodder crops are vetch, which is fed as hay in a mixture with oats or wheat, alfalfa, Egyptian clover, field peas, green corn, and Sudan-grass. As poor natural pasturage supports limited grazing only for a few spring months, this is used for the beef cattle and sheep. Dairy cattle receive either green cut fodder or hay in the barn and occasionally supplementary pasture. Silage is popular in Israel; many settlements have built community silos, and most family farms have small simple ones. The fodder crops grown under irrigation, principally clover, green corn, alfalfa, and a mixture of alfalfa, paspalum, and Rhodesgrass (called "irrigated pasture") yield well. Alfalfa produces up to 6 tons of hay per acre.

Industrial Crops.--Production of industrial crops is gaining in importance, both as a local source of raw materials for Israel's industries and as a means of conserving and earning foreign exchange. Nearly half the area in industrial crops in 1959 was planted to cotton, which has been successfully grown in the country for only a few years. The cotton crop is not large, but by 1957, a poor year, half the country's requirements at that time were met with local production of about 4,000 tons; in addition a small amount was exported to the United Kingdom. By 1959 production had increased to nearly 7,000 long tons of lint, and about 11,000 tons of cottonseed. Imported raw cotton (some 5,000 tons annually in recent years) comes mainly from the United States.

Most of the cotton produced in Israel is Upland type, but around 5 percent is extra long staple type. Jewish farmers produce the entire crop under irrigation, principally in the northern Negeb, but also on the Plain of Sharon in central Israel and near Beit Shean in the north. There has been some interest, notably in the collectives, in imported tractor-pulled pickers, but mechanized harvesting is still uncommon. Five ginning plants are in operation under the supervision of the Cotton Production and Marketing Board, which coordinates cotton growing and marketing in Israel. The Board represents both growers and buyers; fixes the prices of cotton and cottonseed; maintains grading and storage facilities; provides crop insurance from the time of planting through final sale; and cooperates with the Ministry of Agriculture in cotton pest control.



TABLE 12.--Main industrial crops: Area and production of selected years, 1949-59

| Crop and year  | Area planted       | Production             |             |
|----------------|--------------------|------------------------|-------------|
|                | <u>1,000 acres</u> | <u>1,000 long tons</u> |             |
| Cotton:        |                    | <u>Fiber</u>           | <u>Seed</u> |
| 1949 . . . . . | 0                  | 0                      | 0           |
| 1956 . . . . . | 14                 | 3                      | 5           |
| 1957 . . . . . | 12                 | 4                      | 7           |
| 1958 . . . . . | 14                 | 5                      | 8           |
| 1959 . . . . . | 17                 | 7                      | 11          |
| Tobacco:       |                    |                        |             |
| 1949 . . . . . | 2                  | (1/)                   |             |
| 1956 . . . . . | 6                  | 1                      |             |
| 1957 . . . . . | 8                  | 2                      |             |
| 1958 . . . . . | 9                  | 1                      |             |
| 1959 . . . . . | 12                 | 2                      |             |
| Sugar beets:   |                    |                        |             |
| 1949 . . . . . | 0                  |                        | 0           |
| 1956 . . . . . | 2                  | 2/                     | 2           |
| 1957 . . . . . | 3                  | 2/                     | 6           |
| 1958 . . . . . | 6                  | 2/                     | 12          |
| 1959 . . . . . | 7                  | 2/                     | 15          |

1/ Less than 500 tons. 2/ In terms of sugar.

Statistical Abstract of Israel, No. 9, 1957-58; Israel Economic Forum, Vol. IX, 1-2; Embassy reports.

Production of tobacco is mainly carried on by non-Jewish farmers, who have planted Oriental varieties in Israel for many years. Some 80 percent of the crop is grown in the Northern District, especially near Acre and in the hills of western Galilee. No irrigation is used. Annual production of Oriental tobaccos, mainly Trapsun and Cavala, has averaged about 1,900 tons a year over the last decade. Flue-cured tobacco was introduced into Israel in 1952, but because of the chlorine content in the water available for irrigation, the experiment was not successful. Only about 25 tons of low-quality flue-cured tobacco is currently being produced.

Tobacco production is supervised by the Tobacco Section of the Ministry of Finance, which also regulates prices and movement of the crop to prevent smuggling, and supplies raw materials to tobacco industries. Local products are not suitable for cigar or pipe tobacco and require blending with imported leaf for use in medium or high-quality cigarettes. An average of about 700 tons of unmanufactured tobacco has been imported annually in recent years, largely from Turkey, Yugoslavia, and Greece, and, in small quantities, from the United States. While most consumers show a preference for imported

tobaccos, these are heavily taxed; prices for domestic tobacco products are thus held considerably below the retail price for imports, to prevent losses to Israeli growers.

Jewish farmers have successfully raised sugar beets since 1953, when 1,500 acres planted to the crop yielded about 19,000 long tons, all of which was processed for alcohol distillation. By 1955 the crop was being grown entirely under irrigation, and in the following season, the output of 2,000 acres--27,000 tons--was processed into some 1,800 tons of sugar, at two newly opened factories, near Tel Aviv-Jaffa and at Afula. 1957 saw an increase in the planted acreage to more than 3,000 acres from which over 6,000 tons of sugar (or about 10 percent of Israel's sugar requirements in that year) were produced. Substantial expansion in plantings resulted in a 50-percent gain in output of sugar beets in 1958 and a further increase in 1959. Sugar beet production is now mainly limited by present factory capacity, but new facilities are under construction.

Minor quantities of good quality sugarcane are being produced, principally near Beit Shean. Highly saline water, which is available in this valley, can be used to irrigate sugarcane, but has very little other use.

Other industrial crops grown in Israel include imported varieties of flax, which yielded nearly 2,300 tons in 1957 and about 1,000 tons in 1958, principally from the plantations in the northern Negeb. Small quantities of ramie, agave, and kenaf (*Hibiscus cannabinus*) as a possible substitute for jute are cultivated. The Ministry of Agriculture is also experimenting with various indigenous plants, such as the *Juncus* of the southern Negeb, which is comparable to the *esparto* fiber grown in northern Africa, and which, like *esparto*, may provide raw materials required for papermaking.

### Livestock and Livestock Products

The livestock population of Israel consists mostly of cattle, sheep, goats, and poultry. Pigs may be raised only by the Christian community; the use of pork by those of both Jewish and Muslim faiths is prohibited.

Livestock numbers have increased rapidly since the cessation of the 1948-49 hostilities, when a good many animals were killed or driven off, and the uptrend continues. A considerable portion of the increase in Jewish-owned herds represents imported stock. The greater part of Israel's feed requirements for livestock are imported also, although domestic production of feed-stuffs has increased sharply in the last few years.

Cattle are raised in all but the most arid regions. Jewish farmers own nearly 80 percent of the milk stock, and these are usually high-producing animals in contrast to the low-yielding cows kept by Arabs. The average annual milk yield from purebred or crossbred stock on Jewish farms has recently ranged from about 9,200 to 9,900 pounds per cow, or about 2,000 pounds more than the average yield from Jewish and Arab-owned cows combined.

Dairy cattle on Jewish farms are principally the Israeli Friesian

breed, a cross of Damascus, Lebanese, and Arab cows with Holstein-Friesian bulls, which have been imported since 1922 from the United States, Canada, and the Netherlands. The cows are not usually grazed on pasture, but are kept in open-type barns and fed green fodder, hay, and concentrates. Herds range from 2 to 20 cattle in the smallholders' settlements and from 20 to 250 in the collectives. Mechanized milking is practiced in the larger herds, and is gaining favor with herdsmen keeping less than 30 animals.

TABLE 13.--Livestock: Number on farms by type, 1948 and 1957-59 <sup>1/</sup>

| Type                          | 1948   |       |       | 1957   |       |       | 1958  | 1959  |
|-------------------------------|--------|-------|-------|--------|-------|-------|-------|-------|
|                               | Jewish | Other | Total | Jewish | Other | Total |       |       |
|                               | farms  | farms |       | farms  | farms |       |       |       |
|                               | :      | :     | :     | :      | :     | :     | :     | :     |
| Cattle . . . . .              | 34     | 12    | 46    | 114    | 36    | 150   | 180   | 190   |
| Sheep . . . . .               | 22     | 10    | 32    | 112    | 56    | 168   | 170   | 170   |
| Goats . . . . .               | 5      | 33    | 38    | 45     | 117   | 162   | 165   | 155   |
| Horses and mules . .          | 5      | 3     | 8     | 15     | 6     | 21    | 21    | 21    |
| Asses . . . . .               | 2      | 6     | 8     | 5      | 16    | 21    | 21    | 21    |
| Poultry <sup>2/</sup> . . . . | 2,861  | 130   | 2,991 | 5,075  | 175   | 5,250 | 6,100 | (3/)  |
| Laying hens . . .             | --     | --    | --    | --     | --    | 4,000 | 5,000 | 5,500 |

<sup>1/</sup> December 1 of year shown.

<sup>2/</sup> Mostly chickens; in 1957 geese, ducks and turkeys owned by Jewish farmers numbered 250,000.

<sup>3/</sup> Not available.

Statistical Abstract of Israel, No. 9, and Embassy reports.

While the industry is not large, Jewish farmers have increased their beef cattle herds since 1953 from a few hundred calves to about 40,000 head (at the end of 1959), of which 15,000 are breeding cows. Foundation herds of special imported breeds, among them Herefords, Santa Gertrudis, and Brahman, have been built up, and cross-breeding local cattle with beef types has been started. Although on some Jewish farms, beef cattle are fed imported concentrates, the industry is mainly based on the use of available grazing land. Its development in turn depends in large part on the rate of improvement by large-scale reseeding, fertilizing, and regulation of grazing rights.

Cattle kept on Arab farms include a considerable number of oxen, which, with cows, serve as draft animals. The relatively few of these cows milked produce only from an eighth to a seventh of the average milk yield in Jewish-owned herds; most of the milk, cheese, and meat used by the non-Jewish population is that of sheep, goats, and camels, rather than cows.

Sheep and goats are found throughout the country, especially in Galilee,



the Harod and Lake Hula Valleys, on the Mt. Carmel range, the northern Sharon Plain, and in the Negeb. In 1948 the entire sheep population numbered under 33,000 head, of which about two-thirds were in Jewish flocks. By 1958, both Jewish and Arab farmers were raising about 6 times as many sheep as in 1948.

Jewish-owned flocks include some imported fat-tailed Hirik sheep, a Turkish breed, as well as the local Awassi animals. Most Israeli flocks are small; few number more than 500 head.

Some of the Jewish settlements raise lambs for slaughter, but current emphasis is on raising sheep to maturity for breeding and milk production. In general, meat and wool are byproducts of the industry. The wool of the Awassi is coarse and suitable for weaving carpets and rugs only; and the meat of this animal is inferior. Trials of crossbreeding, particularly with the Corriedale, are being conducted in the effort to improve the quality of both wool and meat.

Sheep are principally grazed on natural pasture, but also on fallow land and crop residues, and occasionally on sown cereals. High-producing ewes in Jewish flocks are given supplementary feedings--up to 30 percent of total requirements--of hay, green fodder, silage, and concentrates, and most flocks receive some additional feed in seasons of short pasturage.

Arabs raise most of the goats in Israel on natural pasture for milk and meat; these are mainly low-grade animals. But the third of the country's goats owned by Jewish farmers are principally imported purebred stock of the Saanen breed. Good quality milk goats are important in settlements where lack of water limits the possibilities of raising dairy cattle. A pedigree book for male and female goats on Jewish farms is now being kept, so that standards can be raised.

The total number of horses, mules, and asses kept for work purposes more than doubled between 1948 and 1957. Jewish farmers own most of the horses and mules, and Arabs the majority of the asses. A stud service, maintained at the Farm of Animal Industry in Acre, has Arab and Highland Pony stallions and Spanish breeding donkeys for use throughout the state, but most of the Arab-owned animals are the unimproved breeds. Jewish farmers do not keep camels; these are raised exclusively by non-Jews, as pack and draft animals and as a source of milk, meat, and hides.

One of the chief branches of mixed farming in the Jewish sector is the raising of chickens. Jewish family farmers operate fairly large specialized modern poultry farms, and the cooperative poultry-raising enterprises number their flocks in the tens of thousands; such establishments follow up-to-date poultry-raising practices and employ many automatic devices to reduce labor costs. Eggs are the industry's main source of income, although production of poultry meat is becoming more important.

About one-third of the laying hens are Leghorn, the remainder mainly crosses between Leghorn and other breeds. Meat birds are heavier breeds, such as Rhode Island Reds, North Holland Blues, New Hampshire, Cornish, White Plymouth Rock, and Barred Plymouth Rock. Jewish farmers also raise turkeys, geese,

and ducks for home use and for the market. White Empire turkeys, and Toulouse, Emden, and White Chinese geese have been imported to improve breed flocks. Ducks are mainly of the Peking breeds.

Many non-Jewish farmers in Israel keep a few chickens for eggs and meat, but these are generally undersized and scrawny birds that produce comparatively small eggs. And egg yield per hen is only about a third of that received from hens in Jewish flocks.

Of the livestock products, cow's, sheep's, and goat's milk contribute about a third of the total gross value. Between 1954 and 1957 total milk output increased by 25 percent to 227,000 long tons, of which four-fifths, or 186,000 tons, was cow's milk. Total milk production increased to 254,000 long tons in 1958 and to over 300,000 tons by 1959.

In the 5 years 1955-59 an average of nearly 75 percent of the cow's milk produced on Jewish farms was marketed, largely through Tnuva Marketing Cooperative. Some 60 percent of the cow's milk marketed is normally used for drinking, but because the demand for fluid milk did not correspond to increased production in 1958 and 1959, a larger proportion of the surplus (about 50 percent in 1958) went into the production of cheese and butter in those years. There were 48 registered dairies in Israel at the beginning of 1959; about a third of these handled milk for fluid consumption only.

In recent years of average production, between 10,000 and 12,000 tons of dried milk have been imported annually, largely for use in making soft cheese and fermented milk products; output of soft, cream, processed, and other type cheeses has averaged from 10,000 to 14,000 tons; and about 9,000 tons of leben and lebernia--a fermented milk product similar to yoghurt--has been made. Because of the large amount of cow's milk produced in 1958, the use of imported milk powder for cheesemaking was discontinued, as were sales of imported butter to cheese factories.

Most sheep's and goat's milk is consumed fresh by the owners of the animals, or is used in the fermented state, or for hard cheese.

Domestic production of poultry meat has increased rapidly in the last few years, and now represents the largest portion of Israel's meat supply. Red meat has also shown good gains, largely because of government aid in building up beef cattle herds. While domestically produced beef does not yet meet the demand in Israel, additional supplies of frozen and chilled beef and canned corned beef imported (mainly from the United States, Ethiopia, and Argentina) at the rate of about 10,000 tons annually in the 1956-58 period, were stopped by the government in late 1959. There is usually little or no external trade in meats other than beef.

The number of eggs produced in Israel more than doubled in the first 6 years of statehood, and by 1959 had nearly doubled the 1955 output. This was partly because of improved breeds and increased experience of poultrymen, and was partly a result of various government subsidies, as, for instance, on feed until 1956; then by a producer subsidy on eggs; and later, subsidies to

stabilize prices, which rose sharply during and after the Sinai campaign. Per capita consumption of eggs in Israel has been high in the last few years, although good export markets have been developed and more are being sought. Principal markets are currently West Germany, Italy, Austria, France and Cyprus.

TABLE 14.--Meat: Production, 1955-58, imports, and supply, 1958

| Kind                      | : | :             | :             | :             | :             | Net           | Total         |
|---------------------------|---|---------------|---------------|---------------|---------------|---------------|---------------|
|                           | : | :             | :             | :             | :             | imports       | supply        |
|                           | : | 1955          | 1956          | 1957          | 1958          | 1958          | 1958          |
|                           | : | :             | :             | :             | :             | :             | :             |
|                           |   | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  | <u>1,000</u>  |
|                           |   | <u>L.tons</u> | <u>L.tons</u> | <u>L.tons</u> | <u>L.tons</u> | <u>L.tons</u> | <u>L.tons</u> |
| Poultry meat . . . . .    |   | 15.0          | 21.3          | 20.7          | 31.3          | (1/)          | 31.3          |
| Beef and veal . . . . .   |   | 3.1           | 4.0           | 4.6           | 5.0           | 9.3           | 14.3          |
| Mutton and lamb . . . . . |   | 1.2           | 1.4           | 1.6           | 2.0           | 0             | 2.0           |
| Other meat . . . . .      |   | 1.2           | 1.8           | 2.0           | 2.6           | .3            | 2.9           |
| Total . . . . .           |   | 20.5          | 28.5          | 28.4          | 40.9          | 9.6           | 50.5          |

1/ 20 tons of poultry meat were exported.

Statistical Abstract No. 9, 1957-58, and Embassy reports.

TABLE 15.--Eggs: Production and utilization, selected years, 1949-59

| Year             | : | Production      | : | Net exports     | : | Total supply    |
|------------------|---|-----------------|---|-----------------|---|-----------------|
|                  | : | :               | : | :               | : | :               |
|                  |   | <u>Millions</u> |   | <u>Millions</u> |   | <u>Millions</u> |
| 1949 . . . . .   |   | 243             |   | (1/)            |   | --              |
| 1954 . . . . .   |   | 414             |   | 5               |   | 409             |
| 1955 . . . . .   |   | 504             |   | 4               |   | 500             |
| 1956 . . . . .   |   | 510             |   | 17              |   | 493             |
| 1957 . . . . .   |   | 630             |   | 24              |   | 606             |
| 1958 . . . . .   |   | 886             |   | 107             |   | 779             |
| 1959 2/. . . . . |   | 960             |   | 275             |   | 685             |

1/ Imports in the 1948-52 period averaged 22 million eggs annually.

2/ Preliminary.

Statistical Abstract of Israel, No. 9, 1957-58, and Embassy reports.

Official statistics for production of day-old chicks are not available. But the Poultry Breeders' Union, the largest of a number of organizations through which Israeli poultrymen market their produce, links about 120 breeding farms with total sales of some 30 million day-old chicks annually. In 1957,



about 350,000 chicks were exported to Greece and Cyprus.

Israel imports the greater part of requirements of wool and animal hides. An average of about 850 tons of raw wool (clean basis) were imported annually in the 3 years 1956-58, mainly from the United Kingdom, Uruguay, and the Union of South Africa. In the same period average imports of raw or dried hides (cattle, camel, and horse) totaled about 4,800 tons; principal suppliers were the United States, and the Union of South Africa.

## V. FOREIGN TRADE IN AGRICULTURAL PRODUCTS

Israel is a net importer of agricultural products. The agricultural import surplus, however, is not nearly so large as the total import surplus. Thus, in 1958, agricultural imports amounted to about \$96 million (IL 172 million), or 22 percent of the value of all imports. Agricultural exports in the same year totaled about \$57 million (IL 103 million), but accounted for 40 percent of the value of all exports.

Citrus fruits--largely the Shamouti orange--alone contributed nearly 35 percent of the value of all exports in 1958. Most fresh citrus (as well as the bulk of processed citrus exports) finds a market in the United Kingdom and Western European countries. Western Europe also takes the greater part of Israel's still minor, but increasing, exports of other farm products, chiefly peanuts and eggs in the shell. Arab hostility has prevented trade with neighboring countries, but increased cultural exchange with non-Arabic Africa in the last 2 years had led to the opening there of small markets for Israeli agricultural products.

Agricultural imports consist mostly of wheat and feed grains, fats and oils, oilseeds, meat, sugar, hides and skins, wool, and cotton. The United States is Israel's primary source of agricultural imports, supplying over half, in terms of value, in 1958. Other important sources of agricultural imports in this year were Turkey, the Union of South Africa, and Canada for grains; Brazil, Cuba, and Turkey for sugar; the United Kingdom for wool; the Union of South Africa for hides and skins; and Greece for cotton. Agricultural imports from the non-Arabic African countries are small, but increasing.

Most of Israel's agricultural imports from the United States in recent years have been arranged under special U. S. programs, which have permitted Israel to import without sacrificing dollar exchange. For instance, in 1957-58, U. S. agricultural exports valued at about \$48 million (IL 86 million), or 86 percent of the value of all U. S. exports to Israel during that fiscal year, were shipped under these programs. Commodities worth \$29 million (IL 52 million) were purchased for foreign currency by Israel under Title I of P.L.480; donations for charitable purposes (Title II of the same law) were valued at \$2 million (IL 3.6 million); shipments amounting to \$17 million (IL 31 million) were made under Section 402 of the Mutual Security Act. The commodities supplied to Israel under these special programs have mainly included wheat and flour, feed grains, rice, fats and oils, dairy products, cotton and tobacco.

TABLE 16.--Exports: Value of principal agricultural products, and percent of total exports, by country of destination, 1958

| Commodity<br>and<br>country                | : | Value                | : | Percent of total<br>value of all<br>exports |
|--|---|----------------------|---|---|
|  | : |                      | : |   |
|  | : |                      | : |   |
|  | : |                      | : |   |
|  |   | <u>1,000 dollars</u> |   | <u>Percent</u>                              |
| Citrus fruits . . . . .                    |   | 48.6                 |   | 34.3  |
| United Kingdom . . . . .                   |   | 19.3                 |   |   |
| Scandinavian countries <u>1/</u> . . . . . |   | 10.8                 |   |   |
| West Germany . . . . .                     |   | 5.7                  |   |   |
| Netherlands . . . . .                      |   | 2.9                  |   |   |
| France . . . . .                           |   | 2.7                  |   |   |
| Belgium . . . . .                          |   | 2.5                  |   |   |
| Eggs in the shell. . . . .                 |   | 4.9                  |   | 3.4   |
| West Germany . . . . .                     |   | 3.0                  |   |   |
| Greece . . . . .                           |   | .6                   |   |   |
| Cyprus . . . . .                           |   | .4                   |   |   |
| Italy . . . . .                            |   | .3                   |   |   |
| Peanuts, unshelled . . . . .               |   | 1.8                  |   | 1.3   |
| France . . . . .                           |   | .7                   |   |   |
| Switzerland . . . . .                      |   | .4                   |   |   |
| United Kingdom . . . . .                   |   | .3                   |   |   |
| Other . . . . .                            |   | 1.8                  |   | 1.3   |
| <hr/>                                      |   |                      |   |   |
| Total agricultural exports . .             |   | 57.1                 |   | 40.3  |
| <hr/>                                      |   |                      |   |   |
| Total nonagricultural exports              |   | 84.4                 |   | 59.7  |
| <hr/>                                      |   |                      |   |   |
| Total exports . . .                        |   | 141.5                |   | 100.0                                       |

1/ Denmark, Finland, Norway, and Sweden.

Israel's Foreign Trade, 1958.

TABLE 17.--Imports: Value of principal agricultural products, and percent of total imports, by country of origin, 1958

| Commodity<br>and<br>country        | :             | :     | Percent of total<br>value of all<br>imports |
|------------------------------------|---------------|-------|---|
|                                    | :             | Value | :   |
|                                    | :             |       | :   |
|                                    | 1,000 dollars |       | Percent                                     |
| Wheat . . . . .                    | 22.4          |       | 4.9   |
| United States . . . . .            | 16.1          |       |   |
| Canada . . . . .                   | 3.1           |       |   |
| Turkey . . . . .                   | 2.2           |       |   |
| Feed grains 1/ . . . . .           | 17.6          |       | 4.1   |
| United States . . . . .            | 16.5          |       |   |
| Union of South Africa . . . . .    | .6            |       |   |
| Denmark . . . . .                  | .3            |       |   |
| Oilseeds, edible . . . . .         | 11.2          |       | 2.6   |
| United States . . . . .            | 10.3          |       |   |
| Ethiopia . . . . .                 | .8            |       |   |
| Turkey . . . . .                   | .2            |       |   |
| Butter 2/ . . . . .                | 7.5           |       | 1.7   |
| Sugar . . . . .                    | 6.6           |       | 1.5   |
| Brazil . . . . .                   | 3.5           |       |   |
| Cuba . . . . .                     | 1.1           |       |   |
| Turkey . . . . .                   | .9            |       |   |
| Mexico . . . . .                   | .5            |       |   |
| Cotton, raw . . . . .              | 5.1           |       | 1.2   |
| United States . . . . .            | 3.0           |       |   |
| Greece . . . . .                   | 1.8           |       |   |
| Milk powder 2/ . . . . .           | 3.6           |       | .8  |
| Cheese 2/ . . . . .                | 2.2           |       | .5  |
| Hides and skins . . . . .          | 2.2           |       | .5  |
| United States . . . . .            | .7            |       |   |
| Union of South Africa . . . . .    | .6            |       |   |
| Netherlands . . . . .              | .2            |       |   |
| Wool, raw . . . . .                | .7            |       | .2  |
| United Kingdom . . . . .           | .4            |       |   |
| Union of South Africa . . . . .    | .2            |       |   |
| Other . . . . .                    | 16.7          |       | 3.8   |
| Total agricultural imports . . . . | 95.8          |       | 22.1  |
| Total nonagricultural imports . .  | 337.5         |       | 77.9  |
| Total imports . . . . .            | 433.3         |       | 100.0                                       |

1/ Sorghum, corn, and barley. 2/ Israeli statistics do not show country of origin. However, U.S. exports to Israel during 1958 included 7,716 tons of butter, valued at \$6.1 million; 8,782 tons of nonfat dry milk, valued at \$1.9 million; and 2,900 tons of cheese, valued at \$1.5 million.

Israel's Foreign Trade, 1958.



## VI. DEGREE OF SELF-SUFFICIENCY AND PRODUCTION OUTLOOK

Although domestic output has increased rapidly, it still provides little more than half of Israel's fiber supply, and less than one-third of the caloric value of the food supply. Measured in terms of actual quantities, the home-produced proportion in 1957 amounted to less than 5 percent for fats and oils, 10 percent for sugar, 20 percent for food grains, 40 percent for red meat, and less than 50 percent for the grains fed to dairy cows and poultry. It equaled or exceeded 100 percent only for fruits and vegetables. By 1959, local production of wheat and flour was estimated at from 15 to 20 percent, and other grains only about 30 percent, of domestic consumption.

Efforts to increase the degree of self-sufficiency have been hampered on the one hand by the rapid growth of the population and the relatively high food standards maintained, and on the other by the obstacles to producing basic food crops. Between 1949 and 1959, the population of Israel increased by over 70 percent. At the same time, per capita food supplies were kept at levels that gave Israel a national diet better balanced and more plentiful than that of any other Middle Eastern or Mediterranean country. Since consumption levels also tended to rise, total food requirements increased more than population.

Agricultural production in Israel should increase proportionately as new settlers gain in farming experience, and as more land can be brought under irrigation. But the physical limitations of the country--principally as regards water--and the land settlement pattern will continue to hinder achievement of self-sufficiency in food. The greater part of the water now available is already being used. The division of Jordan waters--which might permit the piping of river water south to the coastal plain and the Negeb--remains an unsettled issue between Israel and the neighboring Arab states. And plans to increase supplies either by desalination of sea water or by the ancient practice of channeling rain from the hills down to small strip farms on the central Negeb plateau are just in the experimental stage.

Land, as well as water, resources are insufficient to support large-scale grazing or the cultivation of grains. While domestic production of red meat may be raised to cover requirements, there is little prospect of attaining self-sufficiency in grain. Shifts in production on the small farms, from surplus output of eggs, milk, and vegetables to cultivation of the industrial and specialized crops which are now being emphasized, will be difficult to accomplish. But future development toward production of cash crops should progressively reduce both Israel's dependence on some current imports and its need for foreign exchange. Citrus fruits will undoubtedly continue as a major foreign currency earner.

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